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# SeaWiFS Postlaunch Technical Report Series

*Stanford B. Hooker and Elaine R. Firestone, Editors*

# Volume 2, AMT–5 Cruise Report

*J. Aiken, D.G. Cummings, S.W. Gibb, N.W. Rees, R.Woodd-Walker, E.M.S. Woodward, J. Woolfenden, S.B. Hooker, J-F. Berthon, C.D. Dempsey, D.J. Suggett, P. Wood, C. Donlon, N. González-Benítez, I. Huskin, M. Quevedo, R. Barciela-Fernandez, C. de Vargas, and C. McKee*

December 1998

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# SeaWiFS Postlaunch Technical Report Series

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# Volume 2, AMT–5 Cruise Report

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## Preface

This report, prepared by Dr. Jim Aiken, Chief Scientist of PML's AMT programme is an outstanding expression of the technical and scientific achievements made in the course of the AMT-5 cruise, 14 September–17 October 1997, which has contributed strategic bio-optical and sea-truthing information to SeaWiFS. AMT has also provided a cost-effective basin scale platform of opportunity to develop wide-ranging initiatives on biogeochemical provinces, biogas production and exchange, plankton and pigment biogeography, and broad nutrient geochemistry for the upper layers of the North and South Atlantic Ocean.

AMT will remain a springboard for data gathering and, increasingly, for process oriented research in CCMS' new core strategic programmes due to start in 1999.

I would like to congratulate Dr. Jim Aiken, associated colleagues, and all the collaborators from NASA, JRC, Italy, SOC and UK universities (UEA, Plymouth), who have contributed through their participation in AMT-5. I look forward to the seminal papers describing the exciting discoveries and achievements in the AMT programme.

*Plymouth, United Kingdom* — R.F.C. Mantoura
*August 1998* Director, PML

The AMT program is a joint experiment with the British and is an unique opportunity to periodically sample the variety of oceanic bio-optical and atmospheric aerosol provinces of the North and South Atlantic Oceans. In fact, the transect traverses nearly 110° of latitude. The first cruise, AMT-1 (Robins et al. 1996), was documented in the *SeaWiFS Technical Report Series* (Prelaunch). To participate in these 5–6 week deployments requires a major effort for all those involved, especially those who deploy from foreign locations, as the SeaWiFS Project staff can testify. Despite the difficulties associated with frequent and prolonged travel, shipping, communications, and extended work at sea, AMT is providing a wealth of new data of exceptional quality for validation and algorithm development. Also, AMT is proving to be an invaluable test bed for refining measurement techniques and equipment designs. I want to thank our British colleagues, particularly the British Antarctic Survey and the Plymouth Marine Laboratory, for inviting the SeaWiFS Project to participate in the program.

*Greenbelt, Maryland* — C.R. McClain
*August 1998* SeaWiFS Project Manager

Abstract

This report documents the scientific activities on board the Royal Research Ship (RRS) *James Clark Ross* (JCR) during the fifth Atlantic Meridional Transect (AMT-5), 14 September to 17 October 1997. There are three objectives of the AMT Program. The first is to derive an improved understanding of the links between biogeochemical processes, biogenic gas exchange, air–sea interactions, and the effects on, and responses of, oceanic ecosystems to climate change. The second is to investigate the functional roles of biological particles and processes that influence ocean color in ecosystem dynamics. The Program relates directly to algorithm development and the validation of remotely-sensed observations of ocean color. Because the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) instrument achieved operational status during the cruise (on 18 September), AMT-5 was designated the SeaWiFS Atlantic Characterization Experiment (SeaACE) and was the only major research cruise involved in the validation of SeaWiFS data during the first 100 days of operations. This third objective involved the near-real time reporting of *in situ* light and pigment observations to the SeaWiFS Project, so the performance of the satellite sensor could be determined.

# 1. INTRODUCTION

The Atlantic Meridional Transect (AMT) Program exploits the passage of the Royal Research Ship (RRS) *James Clark Ross* (JCR) latitudinally through the Atlantic Ocean between the United Kingdom (UK) and the Falkland Islands (approximately 52°N to 52°S) in support of British Antarctic Survey (BAS) research activities in the Antarctic and its environs.† In September, the JCR sails southward, sampling the boreal fall and the austral spring; the following April it returns to the UK, sampling the austral fall and the boreal spring. The cruise track crosses a range of ecosystems and biophysical regimes, within which conditions vary from subpolar to tropical, and from eutrophic shelf seas and upwelling systems to oligotrophic mid-ocean gyres. The JCR is an ideal platform for measuring physical, biological, and bio-optical properties and processes through these diverse ecosystems of the North and South Atlantic Oceans.

The AMT Program goals are to:

1. Test and refine hypotheses on the responses of oceanic ecosystems and the coupled marine atmosphere to anthropogenically-forced environmental change;
2. Develop a holistic research strategy, integrating *in situ* measurements, remote sensing, and modeling;
3. Provide calibration and validation of new satellite sensors of ocean color, sea surface temperature and height, and solar radiation;
4. Improve the knowledge of marine biogeochemical processes, ecosystem dynamics, food-webs and fisheries, and characterize biogeochemical provinces;
5. Develop coupled physical–biological models of production and ecosystem dynamics; and
6. Quantify oceanic responses to changes in abundance of radiatively- and chemically-active trace gases.

It has been an inherent goal of the AMT Program to examine the hypothesis of biogeochemical provinces and determine their characteristic properties. Traditionally, oceanographers have partitioned the oceans on the basis of physical and biological characteristics: for the former, topography, geostrophic flows, wind driven circulation, gyres, fronts, upwelling zones and patterns of seasonal stratification; for the latter, biological productivity, as well as phytoplankton and zooplankton assemblages and community structure. Taken together, this biophysical partitioning provides the descriptors of regional ecosystems or biogeochemical provinces, each with discrete boundaries and each having distinct flora and fauna. The concept of biogeochemical provinces has been promoted particularly as a means of evaluating patterns of basin-scale productivity from remotely-sensed measurements of ocean color, making use of province-specific physical and biological parameterizations (climatological values of the key variables).

There have been four prior AMT cruises: AMT-1 Sep.–Oct. 1995; AMT-2 Apr.–May 1996; AMT-3 Sep.–Oct. 1996, and AMT-4 Apr.–May 1997. AMT-5, coinciding with the start of the operational phase of the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) instrument (18 September 1997), started in Grimsby (UK) on 14 September 1997 and ended in Stanley (Falkland Islands) on 17 October 1997. In between, there was a fueling stop in Portsmouth (15–16 September) and a ship's trials period off Madeira (23–25 September). AMT-5 was designated the SeaWiFS Atlantic Characterization Experiment (SeaACE) as the only major research cruise involved in the calibration and validation of SeaWiFS data during the first 100 days of operations. The specific objectives of SeaACE were to:

1. Derive and report downwelling irradiance, ($E_d$), upwelled radiance ($L_u$), and the diffuse attenuation

† This publication constitutes an official Plymouth Marine Laboratory (PML) cruise report, and its contents have been approved by the Director, R.F.C. Mantoura.

coefficient, ($K_d$), at the SeaWiFS instrument wavelengths;

2. Report measured phytoplankton pigments, by high performance liquid chromatography (HPLC) and fluorometry, in particular, chlorophyll *a* and phaeopigments (where measured) for validating the SeaWiFS level-2 product; and
3. Compare measured and retrieved values of pigments and the diffuse attenuation coefficient at 490 nm, $K(490)$, for validation of the algorithms.

In addition to providing validation data for SeaWiFS (McClain et al. 1998), the AMT-5 cruise contributed to validation activities of the Topography Experiment (TOPEX) satellite and the Radiometric Observations of the Sea surface and Atmosphere (ROSSA) project.

## 1.1 Cruise Strategy

The inital strategy for AMT-1 and AMT-2, involved having only two extra passage days for scientific activities, and was based on one sampling station per day. Each station lasted less than one hour, and was complimented by surface underway measurements using water from the non-toxic supply, and was supplemented by one or two Undulating Oceanographic Recorder (UOR) tows into and out of the station. By AMT-3, additional ship time had been increased to six days, so two daily stations were possible: the primary (late morning) station provided water for productivity and other biological sampling along with a complete set of optical measurements; the secondary (early afternoon) station was restricted to optical instruments that could be deployed rapidly (free-fall profilers that could be deployed by hand). At the outset, the strategy for AMT-5 was to plan for two optical stations per day, subject to other constraints.

The primary station commenced at approximately 1100 (ship's time) to coincide with the SeaWiFS overpass. The principal objective was to acquire optical measurements at the SeaWiFS wavelengths and concurrent data on phytoplankton pigments and species, zooplankton, hydrographic properties, and water for primary productivity, biogases, and nutrients. The main instruments deployed were as follows:

1. Sea-Bird Electronics (SBE) 911plus CTD (conductivity, temperature, and depth) sensor deployments from the dedicated midships gantry, with fluorometer, transmissometer, and photosynthetically available radiation (PAR) instruments, plus a 12×30 l bottle water sampler for phytoplankton pigments, productivity, etc., from 12 depths to 250–600 m;
2. SeaWiFS Optical Profiling System (SeaOPS) casts from the (stern) starboard crane for the measurement of $E_d(z,\lambda)$, $L_u(z,\lambda)$, CT, plus chlorophyll fluorescence ($F$);
3. SeaWiFS Free-Falling Advanced Light Level Sensors (SeaFALLS) casts from the stern for the measurement of $E_d(z,\lambda)$, $L_u(z,\lambda)$, CT, plus $F$; and
4. Repeated zooplankton net deployments from the forward crane.

The SBE CTD, SeaOPS, and SeaFALLS (along with their solar irradiance reference sensors) were provided by the SeaWiFS Project; the former was a new instrument; the latter two had been deployed on previous AMT cruises, but SeaOPS was equipped with more sensors than had been used in the past.

The high quality of the ship's crew (Appendix A) allowed for the safe deployment of all four main instrument systems simultaneously; this was the primary reason why station time could be kept to the shortest time possible without negatively impacting data collection opportunities. For AMT-5, the CTD and SeaOPS were deployed simultaneously and at similar descent rates, approximately $0.25\,\mathrm{m\,s^{-1}}$. At the maximum depth for the optics cast, usually the 1% light level, the CTD system was profiled at a safe speed to the maximum depth of 250–600 m. The two instrument systems were not synchronized for the up casts. The zooplankton nets and SeaFALLS were profiled independently, but the latter was deployed simultaneously with the SeaOPS down and up casts.

Since the SBE CTD (equipped with 12×30 l water bottles) gave sufficient water that only one 45 min cast was needed per station, contingency time for other activities was available. Extra casts were needed on three occasions when bottles failed to close correctly at the deep chlorophyll maximum (DCM) and on the last three days when the rich spring bloom waters of the Sub-Antarctic Convergence Zone (SACZ) were sampled simultaneously with the afternoon optical casts. The second station in the afternoon was always timed to exploit the most favorable sky conditions. In general, this worked well, and many of the afternoon stations were in excellent cloud-free conditions; on only a few occasions were conditions so unfavorable that the afternoon station was cancelled.

When conditions were at their most favorable during the morning or afternoon station, full advantage was taken, and up to two hours were spent on optical casts, which resulted in some of the best optical measurements of any AMT cruise. In the southern-most end of the Brazil Current, but still north of the confluence with the Falkland Current, the waters were consistently low in chlorophyll, so no afternoon stations were scheduled to save time for the more interesting waters farther south. A total of 49 stations was executed (46 full stations, 1 test station, and 2 trial deployments) during which data were acquired from 32 CTD casts (31 SeaWiFS and 1 BAS to 2,000 m), 64 SeaOPS casts, 152 SeaFALLS casts, and 52 Low-Cost NASA Environmental Sampling System (LoCNESS, another optical free-fall profiler) casts. This inventory of measurements, summarized in Table 1, made AMT-5 the

**Table 1.** A summary of the station work executed during AMT-5. The HPLC column gives the surface chlorophyll *a* pigment concentration ($\mathrm{mg\,m^{-3}}$). The time entries are in Greenwich Mean Time (GMT).

| Date | SDY | Sta. | Time | Longitude | Latitude | CTD | SeaOPS | SeaFALLS | LoCNESS | HPLC |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 Sep. | 258 | 0 | 0730 | −0.717 | 50.617 | | 0 | | | |
| 16 Sep. | 259 | 1 | 1422 | −1.652 | 50.460 | 1 | 1 | | | 0.790 |
| 17 Sep. | 260 | 2 | 1605 | −8.457 | 48.670 | 2 | | | | 0.336 |
| 18 Sep. | 261 | 3 | 1008 | −13.205 | 47.983 | 3 | 2 | | | 0.341 |
| 19 Sep. | 262 | 4 | 1013 | −18.482 | 47.173 | 4 | 3 | | | 0.285 |
| 20 Sep. | 263 | 5 | 1010 | −19.963 | 42.842 | 5 | 4 | | | 0.140 |
| | 263 | 6 | 1430 | −19.962 | 42.433 | | | 1–3 | | 0.121 |
| 21 Sep. | 264 | 7 | 1010 | −20.012 | 38.717 | 6 | 5 | 4–7 | | 0.111 |
| 22 Sep. | 265 | 8 | 0644 | −19.530 | 35.448 | BAS | | | | 0.085 |
| | 265 | 9 | 0907 | −19.523 | 35.445 | 7 | 6 | 8–9 | | 0.071 |
| | 265 | 10 | 1430 | −19.145 | 35.043 | | | 10–11 | | 0.065 |
| 25 Sep. | 268 | T1 | 1347 | −17.227 | 32.310 | 8 | 7– 8 | 12–14 | | 0.063 |
| 26 Sep. | 269 | 11 | 1103 | −20.968 | 29.047 | 9 | 9 | 15–20 | | 0.073 |
| | 269 | 12 | 1400 | −20.985 | 28.633 | | | 21–23 | | 0.055 |
| 27 Sep. | 270 | 13 | 1106 | −20.998 | 24.135 | 10 | 10–11 | 24–28 | | 0.161 |
| | 270 | 14 | 1400 | −21.010 | 23.725 | | | 29–31 | | |
| 28 Sep. | 271 | 15 | 1103 | −20.528 | 19.720 | 11 | 12–13 | 32–37 | | 0.631 |
| | 271 | 16 | 1600 | −20.418 | 19.050 | | | 38–39 | | 0.838 |
| 29 Sep. | 272 | T2 | 1106 | −20.010 | 15.492 | | 14 | 40–41 | | |
| 30 Sep. | 273 | 17 | 1104 | −20.870 | 10.922 | 12 | 15 | 42–43 | | 0.230 |
| | 273 | 18 | 1600 | −21.177 | 10.212 | | | 44–45 | | 0.228 |
| 1 Oct. | 274 | 19 | 1102 | −22.472 | 7.027 | 13 | 16–17 | 46–48 | | 0.141 |
| 2 Oct. | 275 | 20 | 1106 | −24.163 | 2.817 | 14 | 18–21 | 49 | | 0.164 |
| | 275 | 21 | 1640 | −24.463 | 2.077 | | 22 | 50–53 | | 0.095 |
| 3 Oct. | 276 | 22 | 1039 | −25.663 | −0.778 | 15 | 23–24 | 54–59 | | 0.116 |
| | 276 | 23 | 1610 | −25.897 | −1.358 | | | 60–62 | | 0.081 |
| 4 Oct. | 277 | 24 | 1140 | −27.368 | −4.787 | 16 | 25–27 | 63–72 | | 0.137 |
| | 277 | 25 | 1600 | −27.598 | −5.308 | | | 73–76 | | 0.079 |
| 5 Oct. | 278 | 26 | 1137 | −29.115 | −8.967 | 17 | 28 | 77–79 | | 0.057 |
| | 278 | 27 | 1700 | −29.382 | −9.613 | | | 80–81 | | 0.058 |
| 6 Oct. | 279 | 28 | 1135 | −30.705 | −12.877 | 18 | 29–33 | 82–85 | | 0.066 |
| 7 Oct. | 280 | 29 | 1135 | −32.363 | −16.685 | 19 | 34 | | | 0.048 |
| | 280 | 30 | 1500 | −32.547 | −17.147 | | 35 | 86–89 | | 0.053 |
| 8 Oct. | 281 | 31 | 1145 | −34.225 | −20.662 | 20 | 36–40 | 90–100 | | 0.056 |
| | 281 | 32 | 1635 | −34.557 | −21.082 | | | 101–102 | | 0.061 |
| 9 Oct. | 282 | 33 | 1145 | −37.285 | −23.903 | 21 | 41 | | | 0.103 |
| 10 Oct. | 283 | 34 | 1135 | −40.977 | −27.690 | 22 | 42 | | | 0.300 |
| 11 Oct. | 284 | 35 | 1200 | −44.867 | −31.620 | 23 | 43 | | 0 | 0.209 |
| 12 Oct. | 285 | 36 | 1243 | −48.860 | −35.477 | 24 | 44 | 103–107 | 1–5 | 0.354 |
| | 285 | 37 | 1755 | −49.450 | −36.090 | | | 107–111 | 6–9 | 0.243 |
| 13 Oct. | 286 | 38 | 1200 | −51.923 | −38.835 | 25 | 45 | 112–119 | 10–14 | 1.400 |
| | 286 | 39 | 1600 | −52.147 | −39.198 | | | 120–122 | 15–18 | 1.023 |
| 14 Oct. | 287 | 40 | 1240 | −54.455 | −42.238 | 26 | 46–50 | 123–130 | 19–26 | 0.814 |
| | 287 | 41 | 1640 | −54.877 | −42.822 | 27 | 51–53 | 131–132 | 27–28 | 1.212 |
| 15 Oct. | 288 | 42 | 1214 | −56.700 | −46.045 | 28 | 54–56 | 133–144 | 29–40 | 0.857 |
| | 288 | 43 | 1709 | −56.753 | −46.540 | 29 | | 145 | 41 | 0.663 |
| 16 Oct. | 289 | 44 | 1243 | −57.660 | −49.795 | 30 | 57–58 | 146–149 | 42–45 | 0.937 |
| | 289 | 45 | 1615 | −58.235 | −49.797 | 31 | 59–61 | 150–152 | 46–52 | 0.556 |
| 17 Oct. | 290 | 46 | 1120 | −57.703 | −51.665 | | 62–64 | | | 0.539 |

most productive for bio-optical data so far in the AMT Program.

## 2. CRUISE TRACK

The AMT-5 cruise started in Grimsby on 14 September 1997 and had a refueling stop in Portsmouth on 15–16 September. After Portsmouth, the vessel followed the usual AMT cruise track westward to 20°W,47°N, with a short diversion on 17 September to answer and assist in a man-overboard distress call. After 20°W,47°N, the vessel followed a southerly course until the enforced suspension of scientific research for a ship's trials period off Madeira from 23–25 September. When the the research program resumed, the vessel continued the southerly course along the 20°W meridian, through the edge of the West African upwelling to 13°N, after which, the vessel altered course to the south–southwest for a way point approximately 200 nautical miles east of Montevideo, Uraguay. From this point, the course was almost due south to the Falkland Islands. The JCR arrived in Stanley during the morning of 17 October and the expedition was terminated. A plot of the complete ship's track is shown in Fig. 1 and a summary of the Scientific Bridge Log is given in Appendix B.

Plymouth Marine Laboratory (PML) scientists and the other members of the scientific party, including colleagues from the United States, Canada, Spain, Italy, and Switzerland, travelled to Grimsby on, or by, Wednesday 10 September. The scientific equipment from various scientific institutes was unloaded Thursday morning and by the end of the first day, most had been installed and the decks were quite clear. This unexpectedly good situation, was undoubtedly a result of the efforts of the many *old hands* on board and the practice established from four previous AMT cruises. With minor exceptions, most instrument systems were operational by Friday. The final scientific preparations were completed prior to departure from Grimsby at 0400 GMT Sunday morning (14 September).

The nontoxic water supply was turned on and the underway sampling commenced at 0700 GMT on 14 September, sequential day of the year (SDY) 257. There was no station sampling on Sunday, but with good progress through the southern North Sea, the Straits of Dover, and the eastern English Channel, there was sufficient time to conduct a *shake-down* or test station (designated Station 0) just east of Portsmouth at 0730 GMT on Monday morning. Station 0 produced almost zero data, because the starboard crane for the SeaOPS rig spurted hydraulic oil over the deck and the CTD termination electrically shorted. Eventually, there was a successful SeaOPS profile, using the 10 t midships crane, but the CTD, although repaired, remained untested. On a positive note, it was valuable to trap these faults early, with ample time to make repairs. Optical data from Station 0, were analyzed, quality assured, and reported to the SeaWiFS Project as a calibration data set (to test the agreed upon reporting formats and procedures).

After loading aviation fuel for the BAS Antarctic bases on Monday afternoon and Tuesday morning, giving time for urgent repairs and modifications, the JCR departed Portsmouth at 1100 GMT 16 September; seawater systems and sensors were turned on at 1330 GMT and underway sampling commenced (every 2 hours) for pigments, nutrients, zooplankton, etc. Station 1 was conducted as planned at 1400 GMT southwest of the Isle of Wight in 40 m water. The following instruments were deployed:

1. SeaOPS using the 10 t crane (a completely successful operation);
2. SBE CTD with one bottle at 2, 5, 10, 15, and 20 m, and six bottles at 25 m (a successful CTD profile resulted, but all of the water bottles leaked);
3. Bongo zooplankton nets from the forward crane (the samples were collected successfully); and
4. The UOR, fitted with a fast repetition rate fluorometer (FRRF), was launched and towed at 4 kts for 10 min to test the sensors and logging systems (which was only partially successful, because the FRRF did not activate).

The optical data were analyzed, quality assured, and reported to the SeaWiFS Project as another test calibration data set. Water from all depths was filtered for phytoplankton pigments, notably three depths within the first optical depth (2, 5, and 10 m).

With repairs to the water bottles completed (the tension for the *power chord* closing mechanisms was set incorrectly by the manufacturer), the scientific party was geared up for a complete station Wednesday morning. Unfortunately, a man-overboard distress call from a Russian sailing ship deflected the JCR from station sampling to a search and rescue mission. The JCR arrived at the site in just over 3 h (average speed 16 kts) and searched for over 3 h with the scientific party acting as lookouts. With the rescue effort called off by 1600 GMT, there was time to deploy the repaired CTD (Station 2) for water samples to 100 m, SeaFALLS to check trim and descent rate, and two zooplankton nets; all were completed successfully. No optical data were reported to the SeaWiFS Project, but water samples were analyzed for phytoplankton pigments.

A deterioration in the weather, force 6 with large swell, was the problem to contend with for Station 3 (1100 GMT) on Thursday 18 September (SDY 261), but the deployment of the CTD, SeaOPS, and zooplankton nets went ahead without any major problems; SeaFALLS was not deployed because of the rough seas and poor illumination conditions. The new CTD worked well with only minor water leakage, although, two separate endcaps sheared off during normal usage. The UOR with the FRRF was deployed at the end of the station and was towed for about 2 h to test the system. The FRRF data looked good, but there was some doubt about the data from the CT sensors. The first SeaWiFS image was received from the PML Remote Sensing Group (RSG) for 16 September. The image showed a good

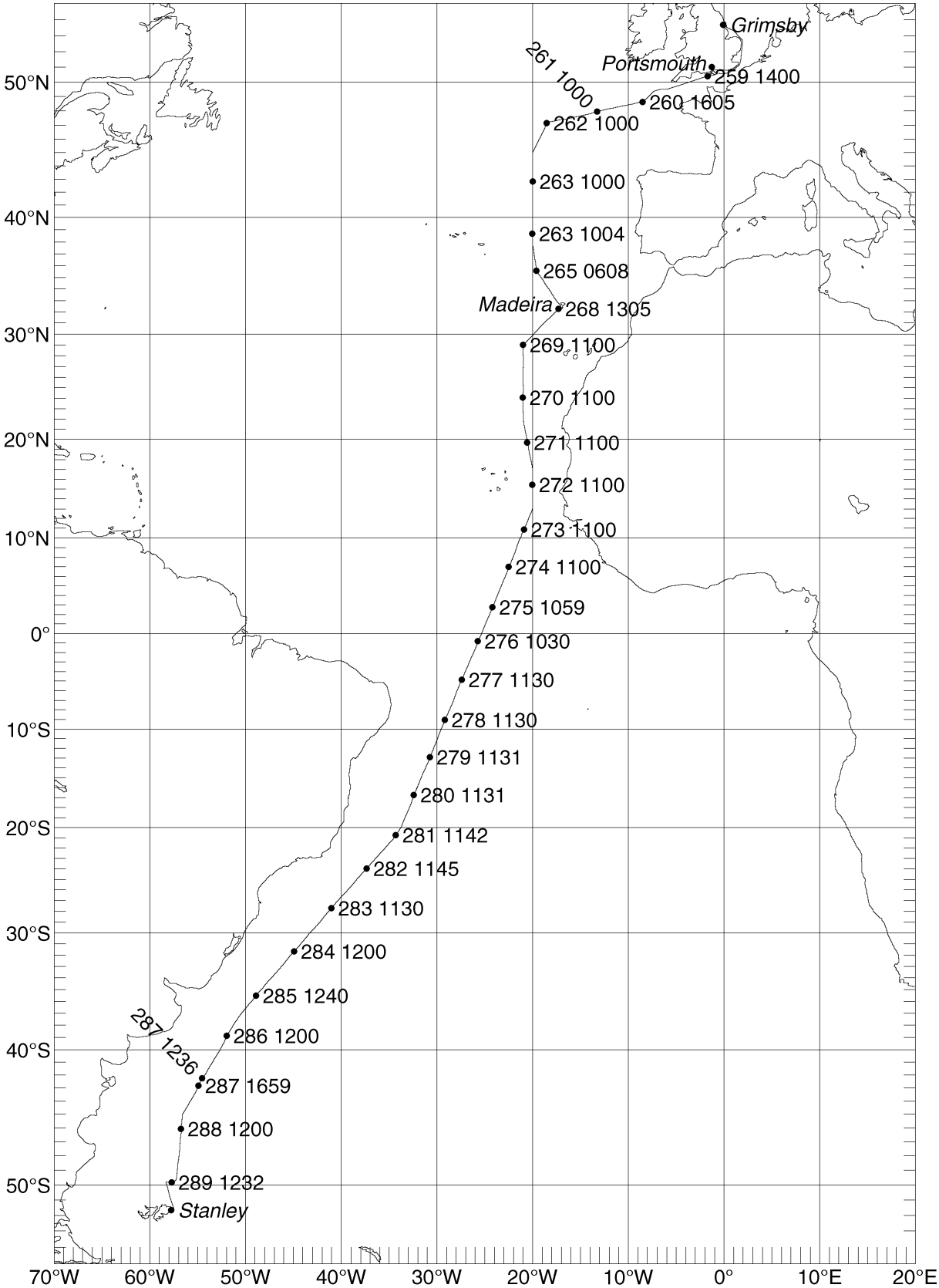


**Fig. 1.** The AMT-5 cruise track.

view of the English Channel, including the area around the Isle of Wight, the location of the station for that day.

The poor weather continued through Station 4, 1000 GMT Friday 19 September, which made the execution of the main station difficult, but everything went ahead without major mishap. Two water bottles failed to *fire* at the depths triggered, although, subsequent investigation showed no cause for the failure. The CTD cast was to a depth of 250 m and lasted 45 min. SeaFALLS was not deployed due to the rough conditions, and the SeaOPS cast lasted only 35 min. The net casts for zooplankton became the longest activity on station which lasted about 1 h. The UOR was towed away from the station for 3 h and FRRF data were recorded. At the end of the tow, SeaFALLS was deployed to test and modify the trim and monitor the descent speed. Optics data for the first three casts, along with pigment data for the first three stations, were reported to the SeaWiFS Project, clearing the backlogs from the first few days and indicating that the data processing of optical data was fully operational. On board quality assurance of measured versus retrieved $K_d(\lambda)$ data were in good agreement, confirming the veracity of both $K_d$ and $L_u$ data to a certain extent.

Station 5 (Saturday 20 September) was the first station in fair seas and light winds, although clouds obscured the sun. Only SeaOPS was deployed during the morning optical station. Problems persisted with the CTD water sampler and four bottles did not fire at their triggered depths. On redeployment, the same four bottles malfunctioned; the suspicion was that excessive tension was to blame (although the tension was measured and found to be within specification) and a new arrangement for the bottle lanyards was prepared as a solution. The UOR was towed out of the station and recovered at 1400 GMT before the afternoon station; good FRRF data were acquired for the third day. Station 6 was restricted to the deployment of SeaFALLS and was the first station in sunshine (with some high cirrus).

Continuing south along the 20°W line, Station 7 (20 September) proceeded as planned with the set routines of CTD, SeaOPS, nets, and SeaFALLS at 1100 GMT. An increasing number of bottle misfires meant that the CTD had to be redeployed to get water from the key depths missed around the chlorophyll maximum; fortunately, with plenty of time in hand for the leg to Madeira, there were no constraints on having a second CTD cast. The UOR was towed away from the morning station and recovered just before the afternoon SeaFALLS station (Station 8). Entering the Canary Islands, Azores, Gibraltar Observations (CANIGO) region, the first nighttime nets were taken at 2100 GMT.

The final station before Madeira (Station 9) was at the CANIGO target position of 36°N. The BAS CTD was deployed to 2,000 m (some of the sensors on the SBE CTD had a depth limitation of 600 m); throughout the 2-hour deployment, multiple net hauls were executed. The SBE CTD and SeaOPS casts went ahead at 1000 GMT which were immediately followed by SeaFALLS deployments. Regrettably, one CTD bottle at the DCM did not fire, necessitating a second CTD cast. There was a second series of rapid SeaFALLS casts later on (Station 10). Since the exclusive economic zone (EEZ) off Madeira was nearby, there was no UOR tow after the station; the ship made full speed for the rendezvous and the dynamic positioning trials.

Two days were spent in the vicinity of Madeira, during which time, any data backlog was processed, and further tests were made on the CTD (some under guidance from SBE by fax). A new sampling strategy was established, whereby of the top six bottles (numbers 7–12 which were nearly always reliable), two would be fired at the DCM and four would be spread through the surface layer; the bottom six, with the two most unreliable bottles (numbers 2 and 6), would be fired below these in the thermocline (the other two unreliable bottles, numbers 3 and 5, were in this bottom six). If the top six bottles fired reliably, a second CTD cast would not be needed. Unfortunately, the bottle spares ordered from the manufacturer when the endcaps sheared off did not reach Madeira before the JCR left Madeira.

Departure from Madeira was delayed to mid-day on Thursday 27 September (SDY 270), 18 hours later than planned, so no regular station work was permitted. Some time was taken for equipment tests, however: the CTD was fired at the surface and at depth to confirm the unreliable bottle numbers. In addition, SeaOPS and SeaFALLS were tested for trim modifications.

Friday 28 September (Station 11) established the pattern for the next few days, with the routine of previous AMT cruises getting set. With the clocks advanced by 2 h, stations started at 1000 ship's time (1100 GMT) with a deep CTD to 600 m (still in the CANIGO region), a SeaOPS cast to 100 m, several SeaFALLS deployments to 150 m, and net casts to 200 m. With only one CTD cast (10 bottles fired reliably), the station was completed in about 1 h. At 1300 ship's time, there was a second SeaFALLS station in good sky conditions, giving the best optics data of the cruise so far. Still in the CANIGO region, there was a night zooplankton net cast at 2200.

An almost identical pattern was followed for Stations 13 (1100 GMT) and 14 (1600 GMT) on 27 September, and Stations 15 (1100 GMT) and 16 (1600 GMT) on 28 September, with excellent optical data being collected during clear sky conditions. All other activities went as planned, with CTD deployments to 600 m being the new set pattern. On Monday 29 September, the ship was in the EEZs between the Cape Verde Islands and Senegal, so no station was executed (no CTD); there were some test deployments of the SeaFALLS profiler which was exhibiting some problems with the auxiliary CT sensors. Another excellent day of clear sky conditions followed on 30 September (Station 17 at 1100 GMT and Station 18 at 1600 GMT) with a matching CTD cast.

Approaching the equator, the weather turned cloudy and overcast with occasional rain squalls, making the optical work difficult at times and less relevant to SeaWiFS validation objectives. Nevertheless, some acceptable casts were accomplished in between the clouds on 1 October (Station 19) and the complete overcast stations were used to intercompare radiometers (Stations 20 and 21 on 2 October). Over these 2 days, the CTD and water sampler worked perfectly (all 12 bottles fired), and the measurement of the pigments and accessory parameters proceeded unhindered.

South of the equator, blue skies with a few fluffy clouds predominated; the conditions were excellent for SeaWiFS validation. Stations 22 and 23 on 3 October (SDY 276), interrupted only by the *crossing the line ceremony*, and Stations 24 and 25 on 4 October provided excellent conditions and lots of casts: at the main morning station (Station 24), there were 3 SeaOPS casts and 10 SeaFALLS casts, which were followed by 3 SeaFALLS casts during the afternoon (Station 25). The large number of casts will allow for an investigation into the broader issues of intra- and inter-pixel variability of optical properties over distances of 1–2 km.

The following two days were hampered by more than the average amount of cloud cover. Two stations were completed on 5 October (Stations 26 and 27), but only one on 6 October (Station 28), with good illumination conditions for at least part of each station. Standard CTD casts to 600 m were completed satisfactorily on each day, with all 12 water bottles firing and closing reliably.

Conditions were overcast for the morning station on 7 October (Station 29), so there was only one SeaOPS cast coincident with the CTD and zooplankton net casts; in the poor illumination conditions, SeaFALLS was not deployed. The UOR was towed from the station and recovered at 1500 GMT prior to the next station. In contrast, the afternoon station (Station 30) was completely cloud free, so there was a second SeaOPS cast to 150 m and four SeaFALLS casts to 200 m; all were rated as probably the best of the cruise to date.

Even better sky conditions were encountered during Station 31 (1130 GMT) on the morning of 8 October (SDY 281), which was completely cloud-free. During this station, 5 SeaOPS casts and 11 SeaFALLS casts were executed; the resulting data set was probably the best optical data ever collected on an AMT cruise. The extra time for optics casts gave ample time for numerous zooplankton net casts and the CTD to be deployed to 600 m. Once again the UOR with FRRF was towed away from the station until midafternoon and produced good data. Cloudy conditions dominated the afternoon casts of SeaFALLS (Station 32), but useful data were acquired.

SeaWiFS images transmitted to the ship showed the spring bloom was well advanced on the Patagonian Shelf. To make good speed as the JCR proceeded south in the Brazil Current towards the productive zones of the Patagonian Shelf, stations were restricted to only one in the morning with a duration of less than 1 hour. Cloudy conditions hampered the SeaOPS casts (Station 33 on 9 October and Station 34 on 10 October), but the CTD and net casts were completed with no problems on both days.

During Station 35 on 11 October (SDY 284), the CTD wire jammed (off a sheaf) when the CTD was at about 180 m. Unfortunately, the CTD cast had to be aborted and no water samples were obtained. The problem was rectified fairly quickly (100 min), but 200 m of cable had to be discarded and the CTD cable reterminated. Meanwhile, the other activities (SeaOPS and net casts) proceeded uninterrupted.

Station 36 on 12 October proceeded smoothly with the CTD, zooplankton nets, SeaOPS, SeaFALLS, and LocNESS all deployed. With the ship back at regular speed, the UOR with FRRF was towed from the morning station to the early afternoon station. A SeaFALLS and LocNESS intercomparison was the feature of the afternoon station (Station 37), which was unfortunately dominated by cloud cover; for both of these stations, there was a significant rise in chlorophyll concentration to over $0.35\,\mathrm{mg\,m^{-3}}$ as the confluence was approached. Late night zooplankton net casts were also executed.

Station 38 on 13 October (SDY 286) was the first in the high chlorophyll waters of the confluence, where the chlorophyll concentration reached $1.4\,\mathrm{mg\,m^{-3}}$ at the surface for the morning station. The heterogeneity of the region was illustrated by the variation in structure of temperature and chlorophyll derived from successive, closely-spaced vertical profiles with SeaFALLS and LoCNESS—five profiles in a row, within 40 min of one another, were all significantly different, some by a large amount. It was the same for the afternoon station (Station 39) when, like the morning, cloud-free skies provided excellent conditions for optical measurements. The UOR was towed again between stations, giving another series of data with the FRRF in waters of high activity for photosynthesis and primary productivity in the spring bloom.

The following day (October 14) proved to be more of the same, with high chlorophyll concentrations and very dynamic physical conditions. The rapid deployment of expendable bathythermograph (XBT) probes through the confluence tracked 6 eddies clustered around a warm core ring, validating the structure in TOPEX imagery for the previous few days (which had been relayed to the vessel from a laboratory on shore). The highly complex vertical structures were reproduced in the phytoplankton taxa and pigment assays. Mostly cloud-free skies gave a large number of good optical profiles with SeaOPS, SeaFALLS, and LocNESS for both the morning and afternoon stations (Stations 40 and 41, respectively). The CTD was deployed to a depth of 600 m for both stations.

For the third day in a row (15 October), the stations were in high chlorophyll water and, for at least part of each period, there was cloud-free, sunny skies providing very good optical conditions and excellent data. Once again,

the CTD was deployed in the morning (Station 42) and afternoon (Station 43).

By Stations 44 and 45, the transect had crossed the Falkland Current, although the water on the continental shelf (300 m) at 5.8°C was probably still influenced by it. Chlorophyll concentrations, although lower than recent days, were still moderate at approximately 1 mg m$^{-3}$. Good conditions prevailed for the optical casts and some of the best data ever obtained south of Montevideo was collected. The UOR was again towed between morning and afternoon stations and the CTD was deployed at both locations. Even more remarkable, for the final station just off Stanley on 17 October (SDY 290), blue skies allowed for a final cast of SeaOPS at 57.500°W,51.667°S (the most southerly station executed in the AMT Program) in high chlorophyll water. Unfortunately, the sun was rather low in altitude at 0900 ship's time, which did not make for the best optical conditions. The CTD was not deployed and the scientific work was terminated after the station.

# 3. RESEARCH REPORTS

In this section, the individual research reports from the scientific groups participating in the AMT-5 cruise are presented.

## 3.1 Physical Oceanography

The primary physical oceanographic measurements during AMT-5 were of water properties and velocities; the former were measured by CTD and XBT casts, and the latter by an acoustic doppler current profiler (ADCP).

### 3.1.1 Water Properties

The CTD measurements were made by profiling a SBE 911plus when the ship was stationary. This usually involved daily stations in the late morning at 1000 or 1100 ship's time. Also fitted to the CTD, were secondary temperature and conductivity sensors, a WETstar miniature fluorometer (Wet Labs, Inc.), a Cstar transmissometer (Wet Labs, Inc.), and a spherical PAR sensor (Biospherical Instruments, Inc.). With these dual CT sensors, the SBE 911plus instrument is self-checking and nominally self-calibrating. The average difference between the primary and secondary sensors was seen to be 0.001°C in temperature ($T$) and 0.005 in salinity ($S$). Salinity values were compared with 70 salinity bottle samples, taken from the top and deepest water bottles from each CTD cast, showing differences typically of less than 0.002.

The CTD package included a rosette water bottle sampling system fitted with 12×30 l polyvinylchloride (PVC) bottles. For most of the cruise, there was one station late morning each day; there were afternoon CTD casts for the last three days (SDY 287–289) in the high chlorophyll regions at the southern end of the transect. The initial CTD casts were troubled by mechanical (and perhaps electrical) problems, which resulted in a number of bottles failing to close properly. The mechanical shortcomings were overcome by adjusting the tensioning in the bottle closing mechanisms (power chords) and altering the lanyard connections to the release latches. An intermittent electrical problem resulted in 1–4 of the release latches failing to fire on each of the first 10 casts. Extensive testing and communication with the manufacturer failed to isolate the problem; however, after cast 10, all latches fired consistently. From casts 5–7 there was insufficient water sampled at the chlorophyll maximum because the bottles failed to close, so a second cast was required. A summary of the CTD log is presented in Appendix C.

For casts 1–8 and cast 31, the CTD was profiled to a depth of 250 m, while for casts 9–30, the CTD was profiled to a depth of 600 m. Data was recorded at 24 Hz via a SBE deck unit onto both a Dell PC and the shipboard computer level-C data logger using BAS Research Vessel Services (RVS) software. Station 23 was aborted at 200 m when the coaxial CTD cable frayed on the winch; no bottles were fired. The CTD was reterminated prior to cast 24. There was one deep CTD cast with a (BAS) Neil Brown Mk IIIB CTD to 2,000 m at 19.5233°W,35.4450°N, within the CANIGO area. A contour plot of the salinity to 200 m is shown in Fig. 2, the fluorometer to 200 m in Fig. 3, and the water transmission at 660 nm, in Fig. 4.

During the cruise, a total of 70 Sippican T–5 XBTs and 66 Sparton T–7 XBTs were deployed (Appendix D). Temperature profiles were obtained down to a depth of 1,830 m for the T–5 probes with the ship slowed to 8 kts, and 760 m for the T–7 probes with no restriction on speed. Typically, the T–7 deployments were at 0700, 1300, 1900, and 2400 ship's time each day. This strategy was altered for regions of special interest (e.g., frontal crossings), at which time T–5 probes were deployed at 50 km intervals. The regions targeted for analysis were:

- 38°N to 35°N, analysis of which showed evidence of the spreading Mediterranean Water centered at a depth of 1,000 m (Fig. 5);
- 10°N to 3°S, which resolved the currents in the equatorial zone (Fig. 6 and Section 3.2); and
- 38°S and 45°S at the confluence of the Brazil Current and Falkland Current systems (Fig. 7).

Occasionally, T–7 XBTs were deployed at the daily station for intercalibration with the CTD. The preliminary analysis of the temperature of the CTD and XBT, shows a consistent structure, but, in general, the XBT values were approximately 0.5°C higher than the CTD. Contour plots of the temperature structure (surface to 750 m) for the Northern and Southern Hemispheres are shown in Figs. 8 and 9, respectively. No calibration correction has been applied to the XBT data shown in the contour plots.

Near-surface $T$-$S$ values were obtained from an SBE thermosalinograph (TSG) using water pumped in from a

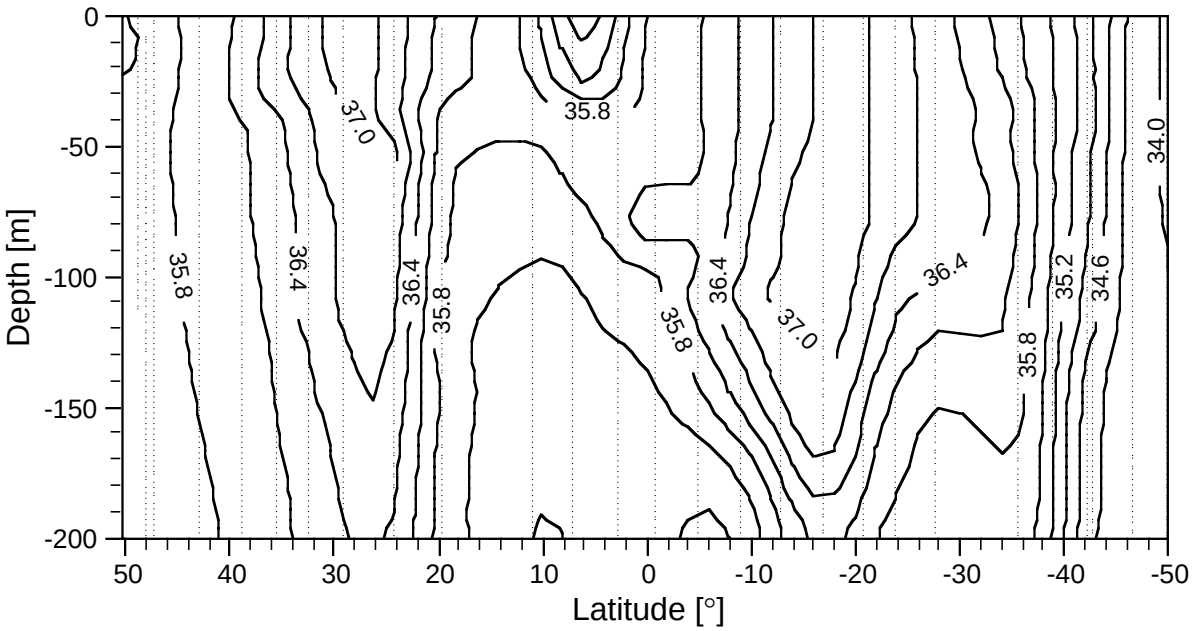


**Fig. 2.** A contoured vertical section of salinity from CTD casts (the dotted lines are the individual CTD stations).

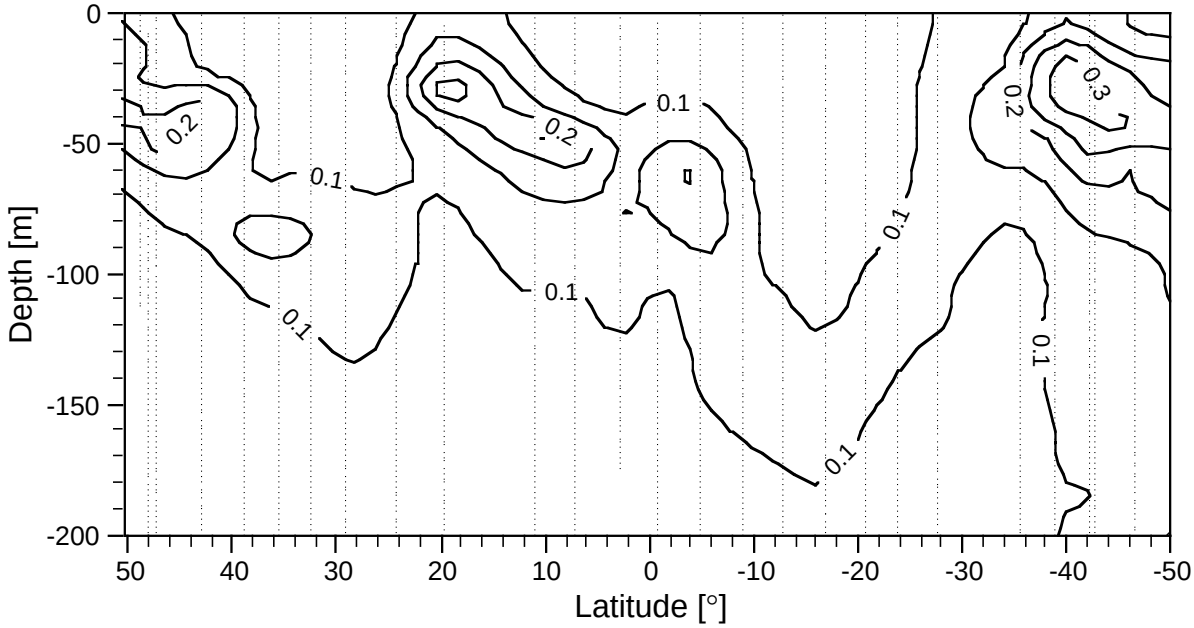


**Fig. 3.** A contoured vertical section of chlorophyll fluorescence from station casts (in volts).

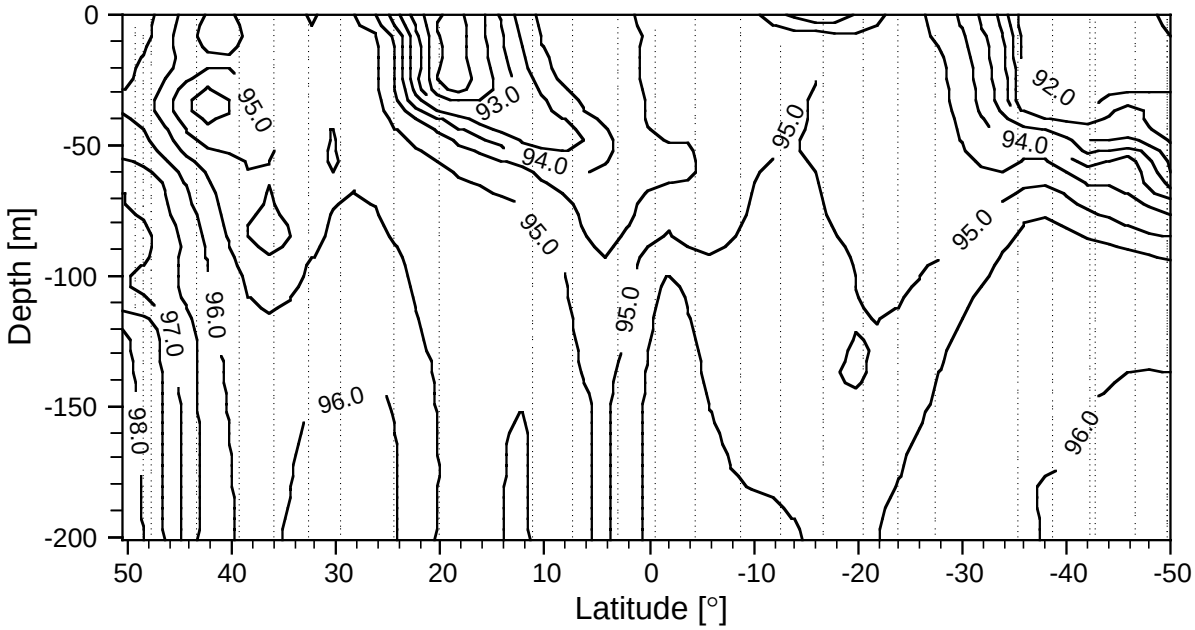


**Fig. 4.** A contoured vertical section of transmittance (%) from station profiles.

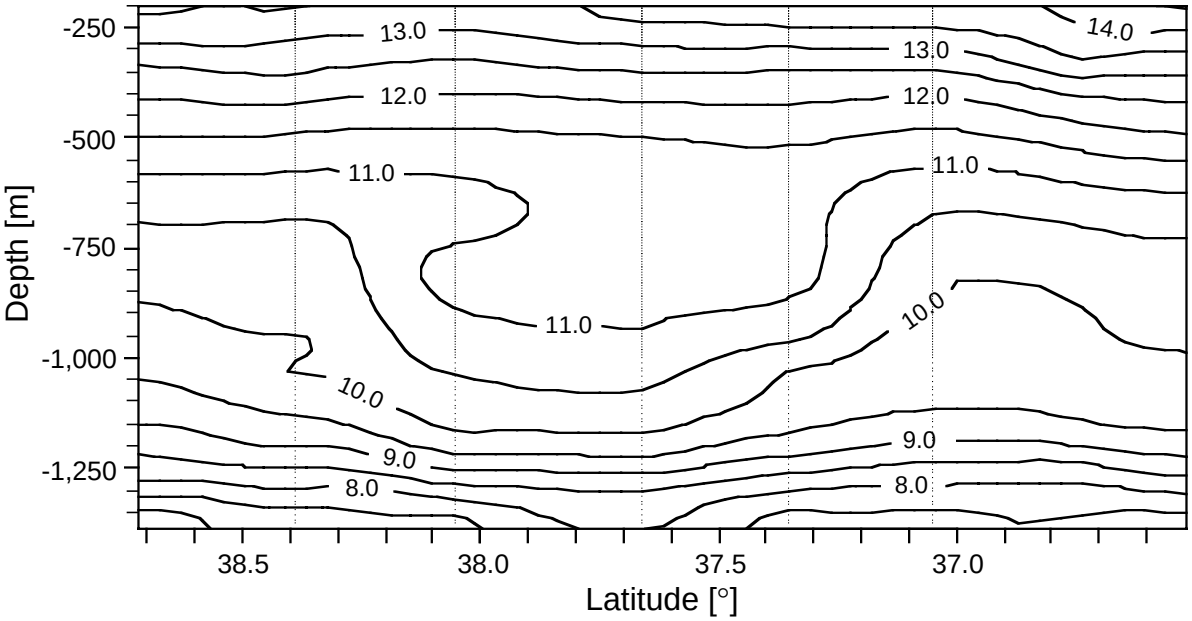


**Fig. 5.** A contoured XBT section (°C) showing Mediterranean Water at 1,000 m (the dotted lines are the individual XBT casts)

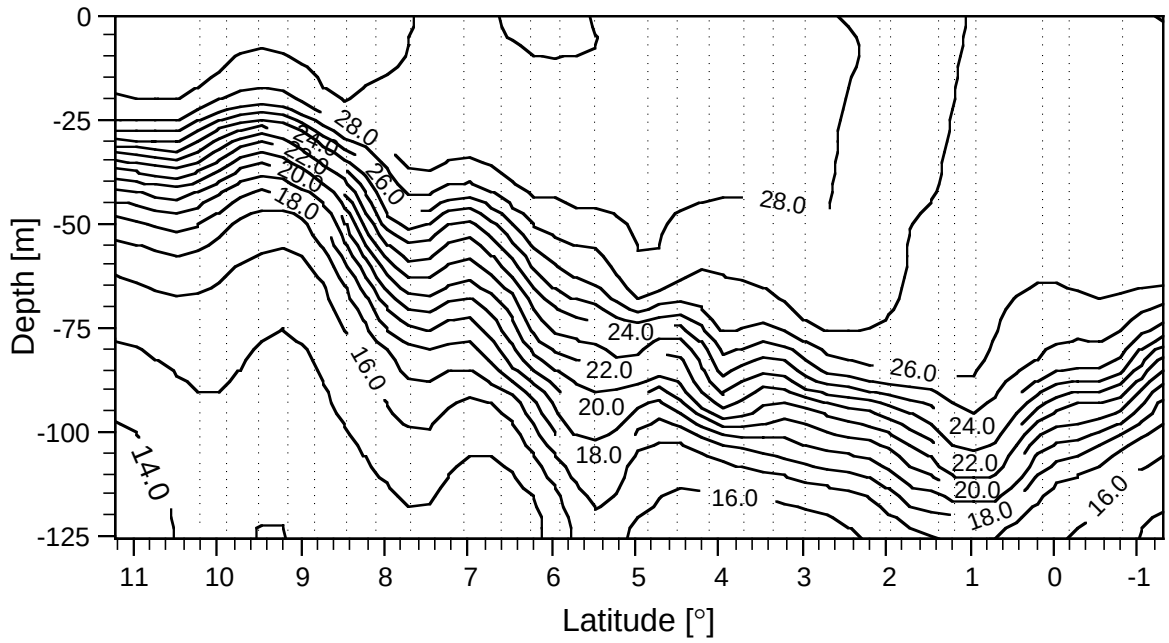


**Fig. 6.** A contoured XBT section (°C) through the equatorial region.

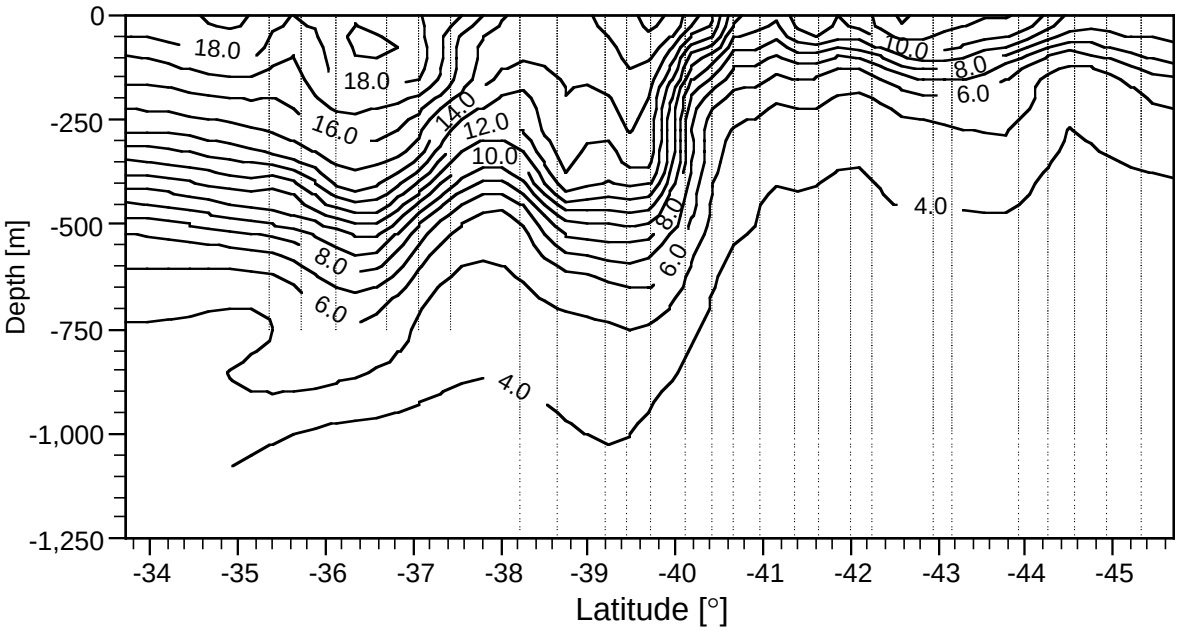


**Fig. 7.** A contoured XBT section (°C) through the confluence region.

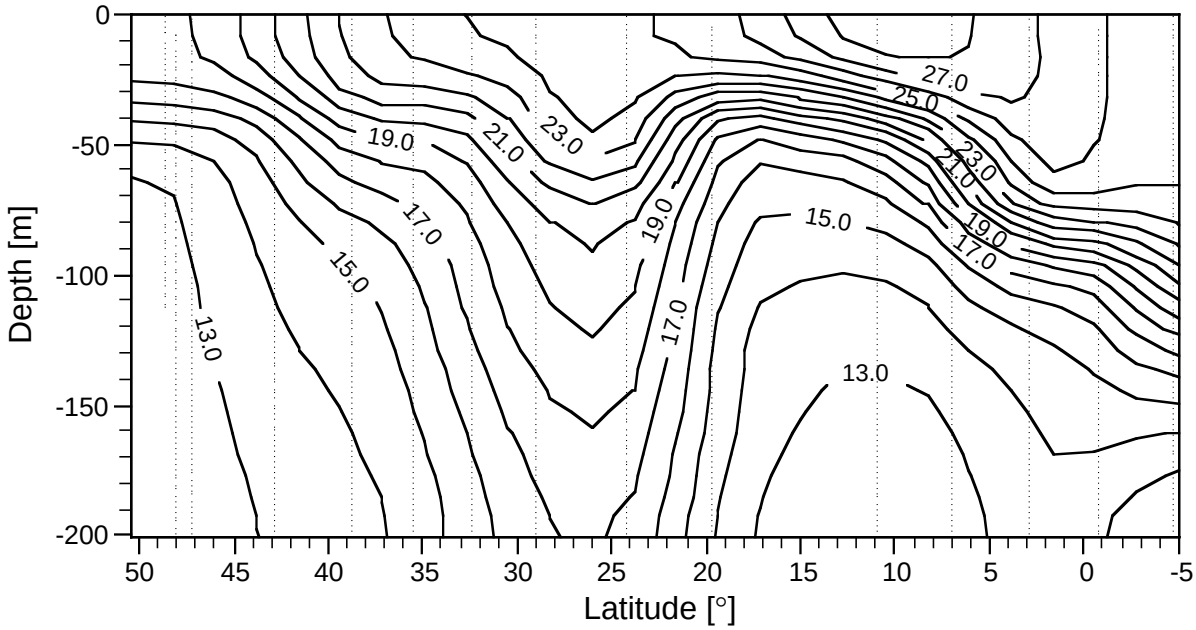


**Fig. 8.** A contoured XBT section (°C) of the Northern Hemisphere.

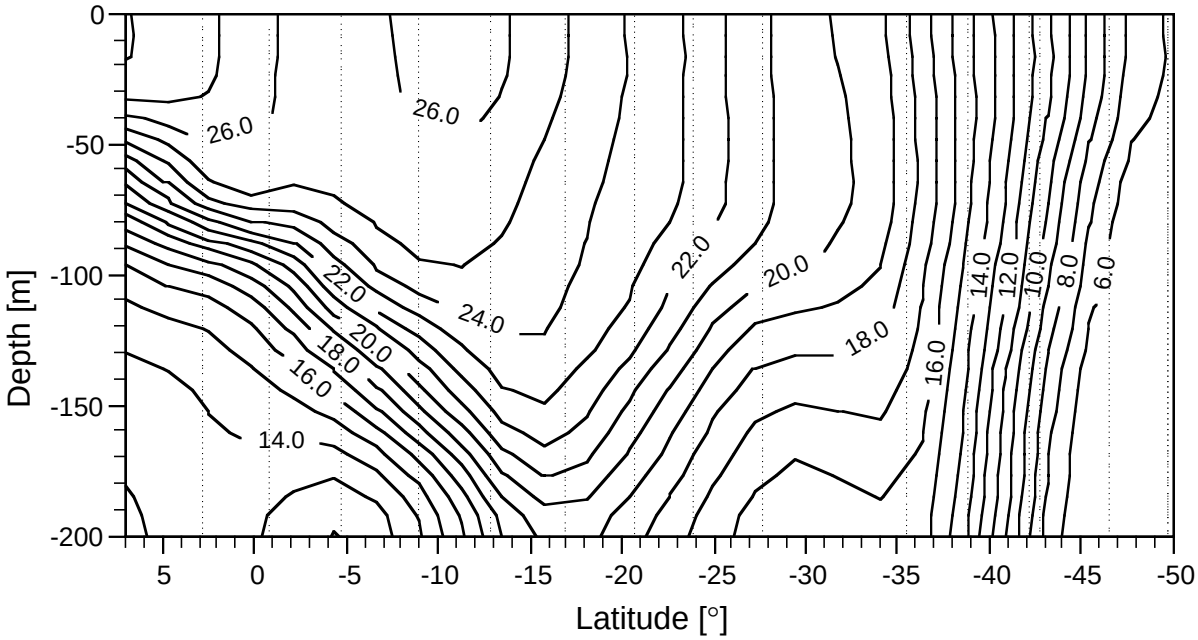


**Fig. 9.** A contoured XBT section (°C) of the Southern Hemisphere.

hull-mounted tube 7 m below the surface. A measurement was made every 5 s, which was logged into the ship's computer system.

### 3.1.2 Water Velocities

The JCR has a hull-mounted 150 kHz Research Designs Instruments ADCP unit. The transducer is enclosed in an oil-filled sea chest recessed into the hull to protect it from ice. This chest is enclosed by a 33 mm thick window of low density polyethylene and filled with silicone oil. The ADCP unit uses a Doppler shift of the signals reflected from four, pulsed acoustic beams radiating out and downwards to derive subsurface currents. The method relies on particulate material in the water to scatter the acoustic signals. The acoustic frequency employed is optimal for scattering from particles of the dimensions of zooplankton.

Data were collected at 2 min intervals in 64 8 m bins. The ADCP data obtained during AMT-5 were logged and archived for subsequent processing. Distinct patterns of zooplankton migration were observed on a diel time scale as the zooplankton migrated to depth during the day and returned to the surface waters (within the ADCP range) by night. The combination of the special housing of the ADCP with high ship speed and very low particle concentrations during the day resulted in signal returns that were undetectable for large parts of the transect within the oligotrophic gyres.

## 3.2 TOPEX

It is particularly difficult to directly validate satellite altimetric measurements over the oceans due to the ever changing topography of the sea surface. In many areas, ocean topography maps often appear to be composed of many chaotic features, whereas in other regions, definite strong and coherent features are apparent. During AMT-5, a concerted effort was made to validate sea surface height (SSH) anomaly maps derived from the TOPEX altimeters using *in situ* measurements derived from XBT, CTD, and underway $T$-$S$ measurements. TOPEX maps of SSH anomaly were used to identify the major features of the AMT-5 transect, which were then used to devise an appropriate *in situ* sampling strategy to resolve the major features seen in the imagery.

The Atlantic equatorial current system displays an east-to-west, and west-to-east banded structure which dominates the surface flow and hydrography of the region. The North Equatorial Current (NEC) is a region of broad uniform westward flow north of 10°N. The easterly flowing North Equatorial Counter Current NECC, is highly seasonal and weakest in February when the trade winds in the Northern Hemisphere are strongest. The South Equatorial Current (SEC) is a broad and uniform westward flow, and extends from approximately 3°N to at least 15°S. The strongest equatorial current is the westward flowing Equatorial Under Current (EUC) centered on the equator at a depth of 100 m. At a depth of 200 m north and south of the equator, there are the narrow and swift North Equatorial Undercurrent (NEUC) and South Equatorial Undercurrent (SEUC), respectively.

The discharge from the Amazon River is carried northwestward and then eastward by the NECC, whereupon it combines with the excess in precipitation over evaporation found in this region. It is limited to a depth of approximately 100 m at about 25°C (Emery and Dewar 1982) and a salinity less 35.0 (Müller-Karger et al. 1988).

The NECC is prevented from flowing north by the east–west orientation of the African coastline; however, some of it does escape north and combines with the NEUC to drive a cyclonic gyre centered at 22°W,10°N. Because of the observed doming of the thermocline in the summer, the gyre is known as the Guinea Dome. The associated circulation reaches to depths of 150 m and exists throughout the year, although, it weakens in winter.

### 3.2.1 Along-Track SSH

The TOPEX satellite was launched in August 1992 and carries the most precise radar altimeters available to date. Two altimeters (C-band and Ku-band) are operated in tandem to facilitate the corrections required to compensate for the delay of the radar pulse caused by variations in ionospheric structure. Further corrections for the effect of tropospheric signal attenuation are undertaken using data derived from an on board microwave radiometer which determines the integrated water vapor content of the atmosphere. Extremely precise orbit tracking and position systems including a laser retroreflector array (for orbit tracking and height determination), a Doppler orbitography and radio-positioning system, plus an experimental global positioning system (GPS), allow the TOPEX satellite orbit to be maintained to within ±500 m. Operating in a 10-day repeat cycle, the TOPEX altimeters provide near-complete coverage of the world ocean between 66°N and 66°S having an equatorial track spacing of approximately 300 km. The precise orbit determination and novel atmospheric correction strategy adopted by the TOPEX mission, when referenced to the most current geoidal model, means that estimated SSH anomaly data have an accuracy of better than 5 cm.

The region of the Atlantic equatorial current system was selected to validate along-track SSH anomaly data derived from the TOPEX altimeter. TOPEX along-track data were spatially interpolated to produce two-day analysis maps at the University of Colorado Center for Astrodynamics Research (CCAR). These data were then supplied to the JCR in near-real time via electronic mail (e-mail) communications.

A combination of *in situ* profiling and underway instruments were used to resolve the vertical and horizontal structure of the region. Temperature profiles were obtained down to a depth of 1,830 m using T–5 XBTs. The

deployment of the T–5s began as the vessel crossed over the Guinea Dome at approximately 20°W,10°N, continuing at 50 km intervals until the equator. In total, 25 XBTs were deployed through the region. Near-surface $T$-$S$ values were obtained from the TSG. A measurement was made every 5 s, which was logged on the ship's main computer system. The density of the surface waters was derived from the near-surface $T$-$S$ values. CTD profiles were made with the SBE 911plus when the ship was stationary, which was deployed at three stations marked in Fig. 10 at 20.87°W,10.92°N, 22.47°W,7.03°N, and 24.16°W,2.82°N to a depth of 600 m.

Figure 10 shows the TOPEX and second Earth Resources Satellite (ERS-2) analysis derived on 28 September 1997 for the region 12°N to 1°S. The AMT-5 cruise track has been overlaid onto this image together with the position of CTD Stations 12, 13, and 14 (heavy circles) and the XBT profiles (squares) completed within the region shown by the image. The TOPEX data reveals an east–west band of positive SSH anomaly greater than 10 cm in the latitude range of 9–4°N. CTD Stations 12 and 14 straddle the positive anomaly to the north and south, respectively, and CTD Station 13 was made in the central region. Complemented by two-hourly XBT casts and underway sampling, these stations were considered adequate for the validation of the SSH anomaly feature seen in Fig. 10.

Figure 6 shows the XBT section derived from 25 XBT casts between the latitudes of 12°N and 1°S along the transect shown in Fig. 10. Within this figure, all of the major equatorial current features are resolved, including the Guinea Dome at 9°N, the NECC bounded by the 28°C isotherm between 8–3°N extending to a shallow depth of 40 m, the EUC shown by a deepening of the thermocline and a separation of the isotherms at 4–1°N, and the SEC together with the equatorial upwelling seen at 1°N.

The NECC and associated currents are best resolved by salinity and density differences rather than by the temperature structure alone. CTD Stations 12, 13, and 14 are shown in Fig. 11. The salinity casts are shown in Fig. 11a and clearly reveal the NECC as a strong surface feature having a marked halocline at a depth of 30 m (Station 13). Station 12 reveals the NEC as a subsurface salinity maximum at a depth of 30 m, whereas Station 14 shows the characteristic deepening of the mixed layer and salinity maximum of the EUC at a depth of 50–100 m. Figure 11b shows the associated temperature cast data and reveals the NECC as a shallow (30 m) warm layer.

As the NECC has a component of less dense water originating from the Amazon outflow, the surface density has been computed from underway temperature and salinity data from 7 m in depth, which is presented in Fig. 12. Here, the NECC is seen between 8.5–4.5°N with a low density core located between 6–7°N. These data are in excellent agreement with the position of the NECC, seen as positive SSH anomaly data shown in Fig. 10, and clearly demonstrate the ability of the TOPEX altimeter to locate major geostrophic current features.

### 3.2.2 Conclusions

TOPEX along-track SSH anomaly data have been interpolated to produce two-day analysis maps which were supplied to the AMT-5 team in near-real time by the CCAR via e-mail communications. These images highlight the two-dimensional oceanographic surface structures which describe the context of the physio-chemical and biological ocean–atmosphere data sets recorded during the AMT-5 experiment. In particular, these data have been useful for determining the large-scale geostrophic current systems in the tropical regions where ocean color and thermal imagery are difficult to obtain due to the large amounts of cloud cover characteristic of these regions. Throughout the AMT-5 experiment, XBT profiles and CTD casts were made, which were used to validate the TOPEX sea surface height anomaly maps.

Imagery supplied on 28 September 1997 clearly highlighted the NECC as the most dominant feature of the AMT-5 transect between 0–12°N and was chosen as a target area for TOPEX validation. *In situ* data sets, including XBT and CTD casts at regular intervals, as well as continuous underway sampling, were used to produce $T$-$S$ sections and surface density measurements along the AMT-5 cruise track between 10°N to 1°S. These data clearly reveal the NECC characterized by warm less-saline waters. SSH anomaly maps derived from TOPEX for the same region clearly show the NECC as a positive SSH anomaly, and the position of the NECC suggested by the TOPEX data agrees exceptionally well with the *in situ* data.

Satellite altimeter data provide an unprecedented view of the ocean surface providing information on the dynamics of geostrophic current systems through differences of ocean surface topography manifested in images of SSH anomaly. Vertical sections of the $T$-$S$ structure of the North Atlantic equatorial current system between 12°N and 1°S identify the features seen in TOPEX SSH anomaly data as the NECC.

## 3.3 ROSSA

In order to understand the regulation of heat, momentum, and gas transfer, improved modeling of the processes defining the structure and state of the air–sea interface is required, which in turn, requires comprehensive *in situ* validation data sets. The current understanding of these processes remains poor, because of the limited availability of existing *in situ* data sets; however, data sets of this nature are required as a forcing function to atmospheric and climate models. In the case of coupled ocean–atmosphere models, understanding and quantification of the processes occurring at the air–sea interface are critical, because it is through this thin layer that all ocean–atmosphere heat, gas, and momentum exchange occurs. Many satellite instruments have complementary spectral wavebands and viewing geometries which provide both regional and global

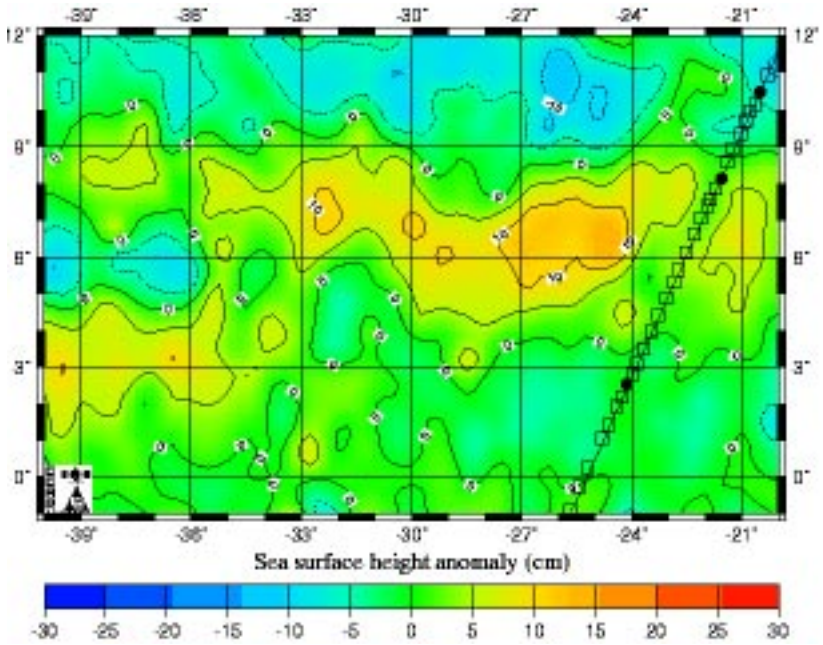


**Fig. 10.** TOPEX/ERS-2 SSH analysis supplied to the JCR for 28 September 1997. Solid circles show CTD stations and open squares show the position of XBT casts along the AMT-5 transect.

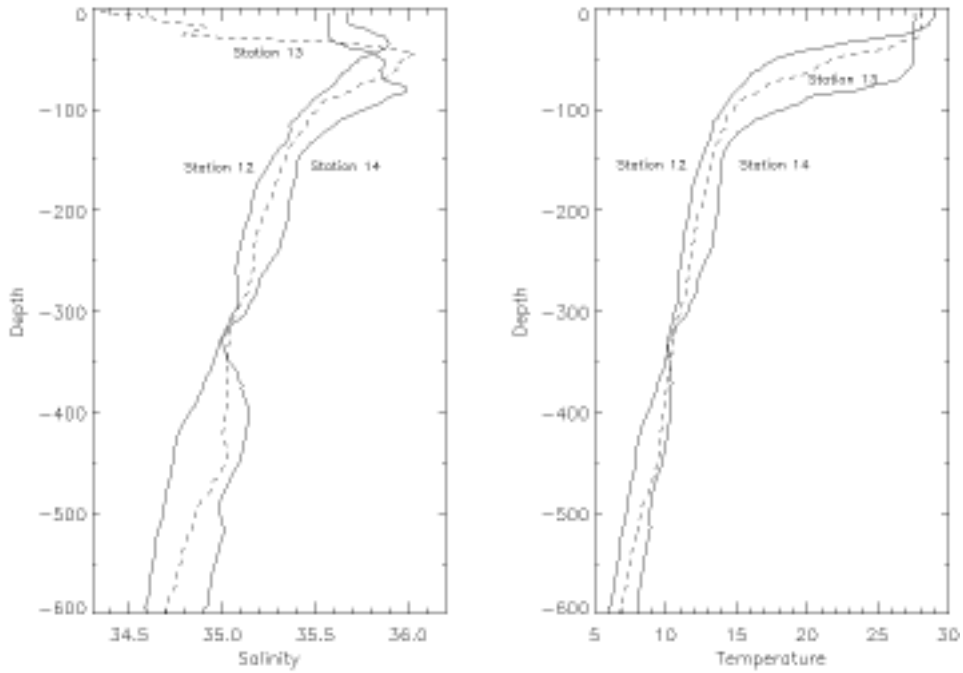


**Fig. 11.** Salinity casts made at Stations 12, 13, and 14 along the AMT-5 transect (left panel) and the corresponding temperature casts (right panel).

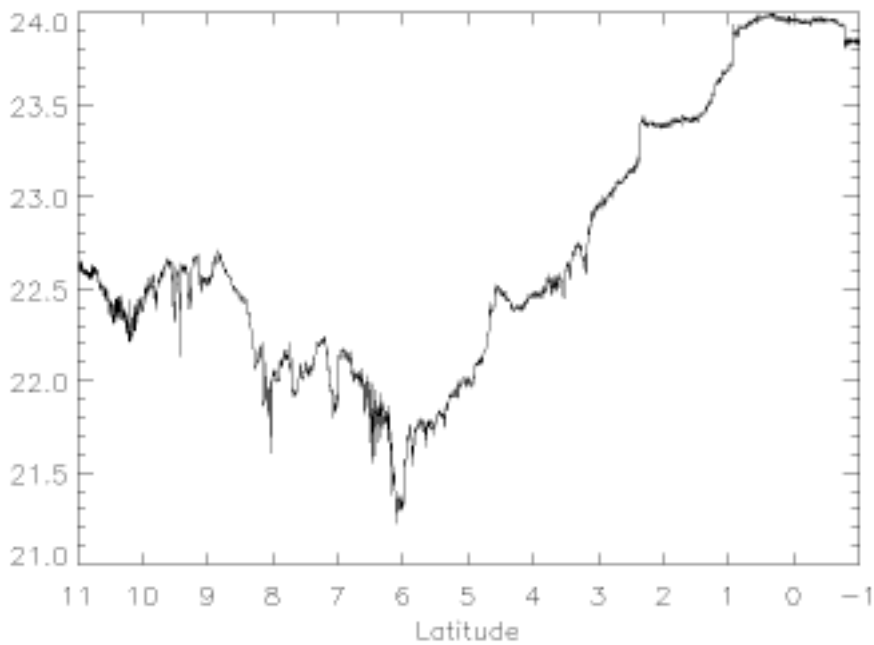


**Fig. 12.** Underway density computed from the 7 m temperature and salinity data along the AMT-5 cruise track.

coverage. Observations of the integrated atmospheric water vapor content or estimates of the surface wind speed, surface roughness, air temperature, cloud cover, and dynamic structure of the ocean are all possible.

The objective of the ROSSA activity within the AMT Program is to increase the understanding of the air-sea interface by obtaining detailed *in situ* oceanographic and meteorological observations of both the interface itself plus the general structure of the deeper ocean and upper atmosphere which define the behavior of the physio-chemical and biological processes occurring at the air-sea interface. These data are collected for use with contemporaneous and spatially coincident satellite observations from the National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR), ERS-2 Along-Track Scanning Radiometer (ATSR), the eighth Geostationary Operational Environmental Satellite (GOES-8), the Meteorological Satellite (METEOSAT) infrared radiometer, the TOPEX radar altimeter, and the Special Sensor for Microwave/Imaging (SSM/I) microwave radiometer. When used synergistically, this combination of satellite and *in situ* observation allows for a more complete description of the sea surface and atmosphere to be obtained. Of particular importance is the need to develop techniques to derive estimates of the heat flux across the air–sea interface from satellite data alone, and to understand the physio-biochemical processes which have a surface interface expression (e.g., biological slick material) by combining *in situ* and satellite data. The AMT program is ideally suited to this task.

### 3.3.1 SOSSTR

This is the second ROSSA experiment to be executed within the AMT Program. ROSSA has a number of objectives.

1. Measure the sea surface *skin* temperature (SSST) of the air–sea interface, atmospheric humidity, longwave downwelling infrared, shortwave solar radiation, and bulk sea surface temperature measurements (BSST) for the investigation of heat and gas exchange between the ocean and atmosphere.
2. Provide the mean atmospheric conditions of the AMT-5 experiment, from upper air profiles of temperature and humidity, which are required to validate the atmospheric transmission models and algorithms used by satellite sensors (in both the infrared, microwave, and visible spectral wavebands), which account for the atmospheric attenuation of water-leaving signals.
3. Provide a precision BSST measurement of the upper 0.5 m of the sea surface.
4. Validate (and calibrate) SSST measurements derived from the GOES-8, NOAA AVHRR, ERS-2 ATSR, and METEOSAT satellite infrared radiometers.
5. Validate new technology for the measurement of the SSST deviation with the aim of deploying semi-autonomous infrared radiometer systems on ships of opportunity.

6. Validate TOPEX altimeter measurements using a combination of XBT and CTD casts together with underway $T$-$S$ sampling.

A new single-channel, broadband (8–12 $\mu$m) infrared radiometer system has been specifically developed through a joint effort of the CCAR and the Southampton Oceanography Centre (SOC), which aims to provide an autonomous system for accurately determining (0.1 K) the SSST. AMT-5 is the first deployment of this system which will be used in a more widespread ship of opportunity sampling program based at the University of Colorado.

The ship of opportunity sea surface temperature radiometer (SOSSTR) consists of two TASCO THI-500L infrared radiometer heads (PRL 500L) mounted in a weatherproof enclosure together with a calibration subsystem, data logging, and communication package. The SOSSTR system uses a two-point continuous calibration obtained by viewing one of two precision blackbody cavities maintained at different temperatures. The blackbody units are attached to an armature which rotates 360° in approximately 12 minutes, thereby providing a complete end-to-end calibration cycle for both radiometer heads. The internal temperature of the instrument is monitored by three separate platinum resistance temperature (PRT) sensors located at different points within the instrument enclosure.

The radiometer output signals, together with instrument thermometry and housekeeping data, are sampled at 16 bits via a Campbell Scientific AM416 multiplexer to a CR10x data logger. Data are logged in real time to a workstation located in the Underway Instrumentation and Control (UIC) room via a dedicated RAD SRM6A/F short-haul modem link run through the ship's scientific wiring. The CR10x uses onboard 2 Mbyte random access memory (RAM) which acts as a *ring buffer* in case of communication problems between the UIC and the instrument. This provides over 5 h of onboard data storage should a communication problem occur. The configuration described above provides large flexibility in terms of real-time data access and instrument control, which can all be achieved using the workstation connection.

The SOSSTR instrument was installed on the forward mast of the JCR to view the sea surface at an angle of 38° from nadir and the sky at the complementary vertical angle using a small laser unit. After initial setup and laboratory calibration of the radiometers and PRT sensors using an SIS T416 digital reversing thermometer and a blackbody unit, the instrument was thoroughly tested on the Grimsby-to-Portsmouth leg. Several problems were encountered including communication, operation, and instrument thermal stability issues. These were traced to a faulty Earth connection and the system was operated continuously for the remainder of the AMT-5 cruise. Additional optical alignment experiments were undertaken *in situ* off Madeira based on discrepancies in the analyzed data, but no adjustment to the optical train was required. The instrument proved to be robust against inclement weather conditions, including heavy tropical rainfall events and up to force 8 sea conditions.

Viasala RS-80 radiosonde packages measuring atmospheric temperature, pressure, and relative humidity were deployed every day. These data were logged to a Viasala PP-11 PTU preprocessor deck unit and finally to a personal computer (PC). Processing software to generate geophysical variables from the raw data were written during the cruise in the Interactive Data Language (IDL). Figure 13a shows the positions of all the radiosonde releases completed during the AMT-5 cruise, and Fig. 13b shows a sample of the processed vertical profiles of potential temperature and specific humidity obtained on SDY 280.

The batch of RS-80 sondes supplied by BAS from the UK meteorological office were more consistent this year, and only one sonde was rejected because of faulty sensors. It is recommended that a future installation of the receiving antenna be located at a higher part of the ship, ideally on the main mast, due to reception difficulties in certain conditions. For example, when the sonde flew to starboard, significant reception deterioration was encountered due to shielding by the ship's superstructure. All data were reported in near-real time to the UK meteorological office as part of the ship's meteorological program.

### 3.3.2 Radiation Measurements

An Eppley longwave (5.0–50.0 $\mu$m) pyrgeometer and shortwave pyranometer (0.3–3.0 $\mu$um) were installed in the JCR foremast *bird table* using custom gimbal mounts. Because of the difficulty of installing and removing a larger mount bracket, which was attached to the top of the bird table during AMT-3, the instruments were directly attached to the side of the mast. Data were logged to a Campbell Scientific CR10x data logger installed at the foremast first stage. Because of data logger problems, these data were available for only the Madeira-to-Stanley leg. Calibration of the pyranometer was a straightforward application of predetermined calibration coefficients; however, in the case of the pyrgeometer measurements, recent evidence suggested that solar heating of both the instrument case and of the filtered hemisphere directly contribute to the measured signal as errors. A correction for these effects will be derived after the Eppley pyranometer has been calibrated at the SOC Institute of Oceanographic Sciences (IOS) pyrgeometer calibration facility.

A second Kipp and Zonen CM-10 pyranometer, owned by BAS and logged by the Oceanlogger system, was installed in the first stage island of the JCR foremast. The instrument was not mounted on gimbals and suffered from shading by the foremast. This effect is difficult to correct for, since signal bias depends not only on the direct shading of the mast but also on any reflection that may occur from the white paint of the mast structure. A full analysis of the differences between the BAS and CCAR Eppley radiometers will be undertaken in the future to correct the BAS pyranometer data.

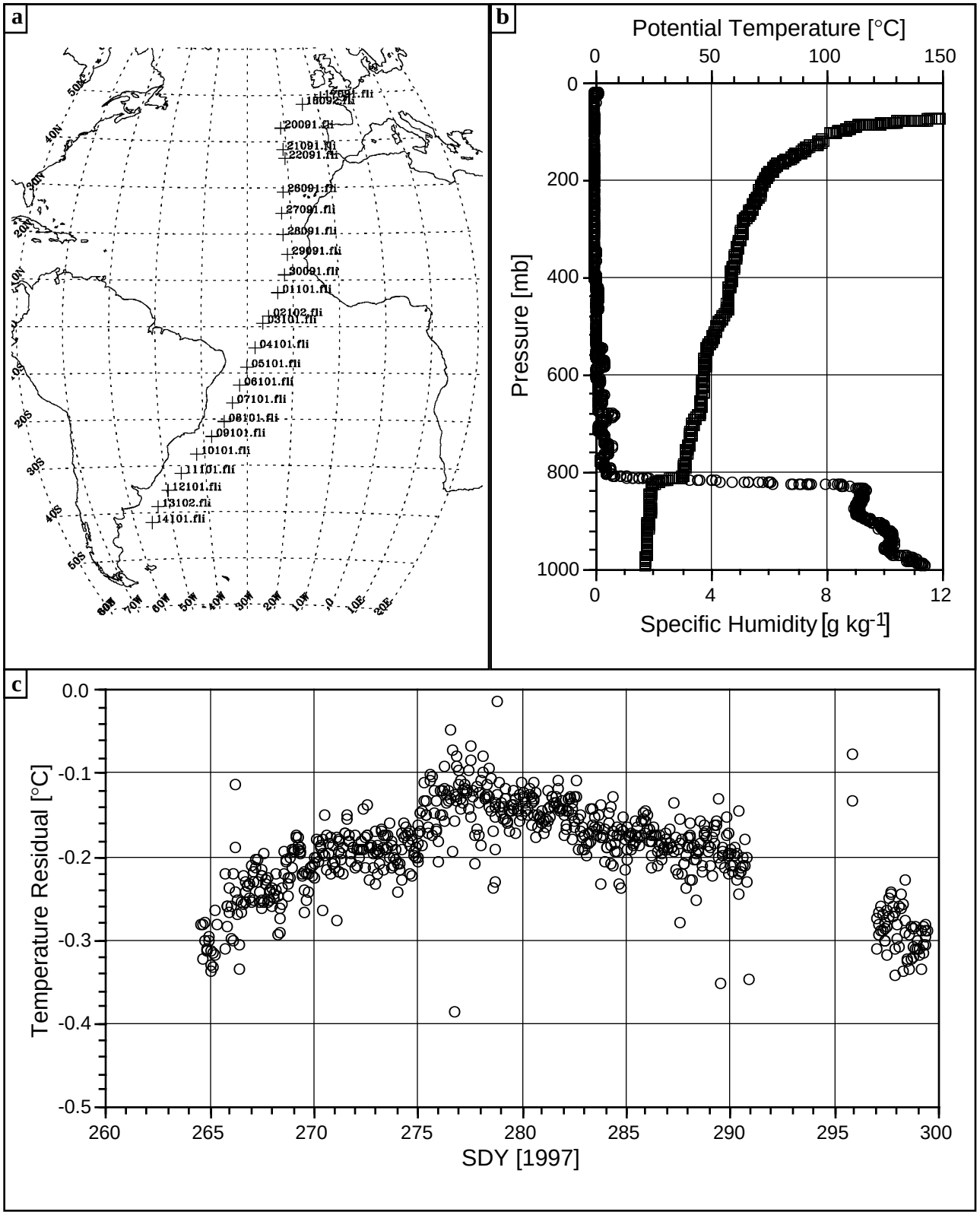


**Fig. 13.** SOSSTR summaries for AMT-5: **a)** the positions of all the radiosonde releases, **b)** potential temperature (squares) and specific humidity (circles) as a function of pressure, and **c)** the temperature difference (residual) between the SST and the hull mounted temperature probe.

Near-surface BSST measurements have been obtained from an IOS trailing thermistor sensor deployed from the port side of the JCR. The thermistor cable is attached to a heavy 12 mm steel cable having a counterweight attached to its length at approximately 2 m from the tether point. The tether was from a 3 m scaffold pole deployed on the port side of the ship. This configuration resulted in superior streaming of the sensor at a depth of approximately 0.05–0.1 m. Data was logged continuously to the Oceanlogger system (channel SP3) for the entire AMT-5 cruise via a Rhopoint frequency module after signal conditioning. BSST data derived from this sensor were accurate to 0.02 K after the following polynomial coefficients were applied to the logged frequency data: PDM009 calibration run number SP21897A (08–19–1997) $C_0 = 65.39008$, $C_1 = -0.108196$, $C_2 = 1.258201 \times 10^{-4}$, and $C_3 = -9.341802 \times 10^{-8}$.

Significant temperature differences in excess of 1 K were found when the trailing thermistor data were compared with the scientific BSST data. These were due to the vertical stratification of the water column and highlight the need for this type of independent temperature sensor, especially for air–sea exchange studies.

In order to check the accuracy of the ship's BSST (7 m temperature), periodic *bucket* casts were made throughout the cruise. The *in situ* sensor on the JCR is difficult to calibrate because of its installation location. The 5 m CTD temperatures can be used, although, the ship is no longer moving through the water during CTD deployments. The primary aim of the science PRT is to apply a correction to the more accurate and precise TSG located within the ship, which derives a more precise BSST having a warm bias due to water flowing through the ship's internal pipes and pumping system. As shown in Fig. 13c, the simple correction shows a distinct nonlinearity with the BSST itself. Bucket SST observations made on a daily basis show that the science PRT is accurate to within the tolerances of the bucket determination (±0.1 K). The quadratic coefficients required to correct the $T$-$S$ data for ship warming are as follows: $C_0 = 0.410645$, $C_1 = 0.991333$, and $C_2 = -2.38419 \times 10^{-5}$.

### 3.3.3 Meteorological Observations

Since the BAS Viasala HMP-30 humidity sensor (osmotic type) was unavailable, a World Ocean Circulation Experiment (WOCE) standard IOS psychrometer unit was installed ino the JCR foremast in a clean air stream. The unit used an electric fan to aspirate a wet and dry PRT sensor located in a robust sun shield. These data were logged via Rhopoint modules to the Oceanlogger system (channels SP1 and SP2) for the entire AMT-5 transect. Wet and dry bulb air temperatures (accurate to better than 0.02 K) were obtained by applying the following calibration coefficients to these data streams: psychrometer IO2001 wet-bulb calibration run number TW22397A (08–19–1997) $C_0 = -10.17774$, $C_1 = 3.778868 \times 10^{-2}$, $C_2 = 2.720534 \times 10^{-6}$, and $C_3 = -3.03224 \times 10^{-10}$; and psychrometer IO2001 dry-bulb calibration run TD00897A (08–19–1997) $C_0 = -10.18599$, $C_1 = 3.809756 \times 10^{-2}$, $C_2 = 2.238674 \times 10^{-6}$, and $C_3 = -1.021467 \times 10^{-10}$.

During the cruise, the bridge officers kept an hourly log of the general atmospheric conditions including cloud type and amount, swell direction and magnitude, and sea state. This is available on request as an American Standard Code for Information Interchange (ASCII) text file.

### 3.3.4 Satellite Data Sets

Several satellite data sets, including GOES-8, NOAA AVHRR ERS-2 ATSR, SSM/I and the METEOSAT sensors, are available to the AMT-5 cruise participants (on request).

## 3.4 In-Water Optics

As with many of the other types of measurements collected during AMT-5, optical data were collected underway and on station. The UOR and a hand-held sun photometer provided the majority of the former; whereas, the latter were provided principally by three different multispectral profiling systems: SeaOPS, SeaFALLS, and LoCNESS (Appendix E). SeaOPS was deployed using a winch and crane, whereas, SeaFALLS and LoCNESS are tethered systems that were deployed by hand. The crane used with SeaOPS had about a 10 m reach over the side of the ship, and the tethered systems were at least 30 m away before any data were collected. All of the in-water profiling instruments collected $E_d(z, \lambda)$ and $L_u(z, \lambda)$ data.

Underway and station surface (solar) irradiance data were provided by an in-air irradiance sensor, $E_s(0^+, \lambda)$, that was mounted on the port trawl post mast, as part of SeaOPS; the SeaWiFS Square Underwater Reference Frame (SeaSURF), which is composed of an in-water irradiance sensor, $E_d(0^-, \lambda)$, suspended below a tethered, square floating frame; the SeaWiFS Buoyant Optical Surface Sensor (SeaBOSS), which is composed of an in-air irradiance sensor, $E_s(0^+, \lambda)$, fitted inside a buoyant collar, so it can be deployed on a mast or as a tethered buoy; and a PAR sensor (with a deck cell) which was integrated into the CTD system.

The redundancy in optical instruments deployed on AMT cruises is a direct consequence of the weaknesses and strengths associated with winch and crane deployment systems versus tethered or free-fall systems. Optical instruments deployed with crane and winch systems potentially suffer from more disadvantages than advantages:

1. Cranes have a limited reach, so ship shadow can be a problem.
2. The ship is not decoupled from the ocean surface, so roll and pitch can cause measurement problems (particularly for irradiance sensors).

3. Winches and cranes are sophisticated electromechanical systems, so there is a continuing vulnerability associated with breakdowns, this is especially so with the hydraulic subsystems.
4. Winches and cranes require relatively lengthy preparation time for operations to begin and end, which means a quick cast during optimal sky conditions is difficult to achieve.
5. The instruments are not lowered into the water until they are far from the side of the ship, so there is very little chance of them being damaged by wave action.
6. Many winches have relatively low descent and ascent rates, so the cycle rate for a complete cast is relatively long. (A long cycle rate means cloud contamination during a cast is very likely. This means the cast must be temporarily stopped to allow the cloud to pass, which in turn adds to the time required.)

Tethered (or free-fall) systems, in comparison, have more strengths than weaknesses:

A. The reference(s) and profiler are deployed away from the ship clear of any ship-induced perturbations to the light field.
B. The profiler is not subject to wave action, but it must be properly trimmed to ensure minimal tilts during descent.
C. A free-floating reference is not decoupled from surface motion, but engineering solutions and deployment practices can be adopted to reduce this effect.
D. There is a direct cable connection between the instruments and the data acquisition units, so there is no complicated (hydraulic) machinery or electrical (slip ring) connection which can require long repair times in the event of a failure.
E. The cable is usually a lighter weight material than steel (e.g., Kevlar®†), and is more easily damaged in comparison to the standard hydrowire used with winch systems.
F. The instruments are usually hand lowered close to the side of the ship, so they are vulnerable to damage by wave action.
G. Deployment and recovery can be accomplished with only two scientists (and no crew), so a rapid cycle rate can be achieved.

The latter is particularly important, because it means casts can be executed in between cloud passage and more casts can be done in a particular unit of time. It also means station scheduling can be kept informal with the ship being stopped only when the illumination conditions are optimal.

Since station time is limited during AMT cruises, it is not always apparent immediately before a station which system will produce the best data. Part of the difficulty arises from the competing requirements of all of the instrumentation that is deployed at each station and the vessel maneuvers (to counter wind, wave, and current effects) which are required to maintain station. Profilers require the vessel to stay clear of the instruments which usually means some forward motion is needed. Unfortunately, forward motion is not always an option, since the other instruments can be negatively affected by this movement. If conditions permitted, the daily station included simultaneous SeaOPS and SeaFALLS (and at times LoCNESS) casts, and when conditions prevented simultaneous casts, SeaOPS was deployed first, and the tethered instruments were deployed soon after.

All of the radiometers used with the UOR, SeaOPS, and SeaFALLS, including any spares, were manufactured by Satlantic, Inc.† (Halifax, Canada). This commonality in equipment was not by accident; the AMT optical scientists decided this was the easiest way to ensure redundancy and intercalibration. The UOR and SeaOPS use 7-channel ocean color radiance series 200 (OCR-200) sensors, as well as 7-channel ocean color irradiance series 200 (OCI-200) sensors. The OCI-200 and OCR-200 radiometers use 16-bit analog-to-digital (A/D) convertors and are capable of detecting light over a four decade range. SeaFALLS, SeaSURF, and SeaBOSS are all equipped with 13-channel OCI and OCR series 1000 radiometers, which employ 24-bit A/D converters, and are capable of detecting light over a seven decade range.

A spare OCR-200 (S/N 035) and OCI-200 (S/N 029) were taken on AMT-5 to provide redundancy for the UOR and SeaOPS. All of the series 200 radiometers made measurements in the same seven spectral bands (approximately 412, 443, 490, 509, 555, 665, and 683 nm), which were selected to support SeaWiFS calibration and validation activities (McClain et al. 1992); in comparison, the series 1000 radiometers cover the SeaWiFS bands plus other parts of the spectrum in greater detail.

Towards the end of the cruise, SeaOPS was reinstrumented with spare components. The original SeaOPS light sensors and data acquisition unit were used to build LoCNESS which is very similar to SeaFALLS in looks and functions. Daily monitoring of the calibration of the UOR, SeaOPS (and LoCNESS), SeaFALLS, SeaBOSS, and SeaSURF radiometers was provided by the SeaWiFS Quality Monitor (SQM), which was used on AMT-3 (Hooker and Aiken 1998) and AMT-4.

† Kevlar is a registered trademark of E.I. du Pont de Nemours and Company, Wilmington, Delaware.

† Identification of commercial products and equipment to adequately specify or document the experimental problem does not imply recommendation or endorsement, nor does it imply that the equipment identified is necessarily the best available for the purpose.

### 3.4.1 SeaOPS

SeaOPS is composed of an above-water and in-water set of sensors comprising several subsystems. The in-water optical sensors are a downward-looking radiance sensor which measures upwelling radiance, $L_u$, and an upward-looking irradiance sensor which measures downwelling irradiance, $E_d$; the former is a Satlantic OCR-200 sensor (S/N 021), and the latter an OCI-200 sensor (S/N 029). There is also a WetLABS minifluorometer and a CT probe. All of the sensors send their analog signals to an underwater data unit, a Satlantic DATA-100 (S/N 004), which converts the analog signals to RS-485 serial communications. The above-water unit, a Satlantic Multichannel Visible Detector System (MVDS), measures the incident solar irradiance just above the sea surface, $E_s(0^+)$. The MVDS unit (S/N 009), is composed of an OCI-200 irradiance sensor (S/N 030) packaged with a separate A/D module that converts the analog output of the OCI-200 radiometer to RS-485 serial communications. For AMT-5, the two units were mounted on top of a pole that was sited on top of the port stern gantry masts. The pole is long enough to ensure none of the ship's superstructure shadows the irradiance sensor under most illumination conditions.

The RS-485 signals from the MVDS and the DATA-100 are combined in a Satlantic deck box, the PRO-DCU (S/N 023), and are converted to RS-232 communications for computer logging. The deck box also provides the (computer controlled) direct current (DC) power for all the sensors and is designed to avoid instrument damage due to improper power-up sequences over varying cable lengths. For AMT-5, the MVDS cable length was approximately 25 m whereas the DATA-100 cable length was about 280 m (250 m on the winch and 30 m from the winch to the deck box).

A custom-built profiling rig was used to carry SeaOPS. This rig was the same one used during the previous AMT cruises (Robins et al. 1996). The positioning of the equipment on the rig was developed with a geometry that ensured all radiance sensors did not view any part of the support. The narrow geometry of the rig was designed to provide a minimal optical cross section. The field of view of the irradiance sensors was only influenced by the 7 mm wire and careful attention was paid to the balance of the rig, even though SeaOPS has tilt and roll sensors. The rig was trimmed with lead weights in air, accounting for the in-water weights of the sensors; after final assembly of the rig, visual checks for correct trim were carried out *in situ*.

The profiling rig was deployed from a midships crane with a reach of about 10 m over the starboard side of the ship. The typical lowering and raising speed of the winch was approximately 20–25 cm s$^{-1}$. For most stations, the sun was kept on the starboard side except during adverse weather conditions. In addition, sea- and sky-state pictures were taken using a charge-coupled device (CCD) digital camera during almost all of the optical stations. The digital photographs were usually taken at the bottom of the SeaOPS down cast.

Data was logged on a Macintosh PowerPC 7300/200 using software developed at the University of Miami Rosenstiel School for Marine and Atmospheric Science (RSMAS) and the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC). The software, called Combined Operations (C-OPS), is written in LabVIEW and is used to control both the in-air and in-water SeaOPS data streams. The primary task of C-OPS is to integrate the RS-232 outputs from the deck box that handles the power and telemetry to the underwater optical instruments and to control the logging and display of these data streams as a function of the data collection activity being undertaken: dark data (caps on the radiometers), upcast, downcast, constant depth soak, along track, etc. All of the telemetry channels are displayed in real time and the operator can select from a variety of plotting options to visualize the data being collected.

C-OPS file naming is handled automatically, so all an operator has to do is select what data streams are to be recorded and then set the execution mode of the data collection activity. Each tab-delimited file has a single header, identifying what is recorded in each column, and all data records are time stamped. The files are written in ASCII and are easily viewed with a simple text editor or ingested into a commercial off-the-shelf (COTS) spreadsheet software package.

### 3.4.2 SeaFALLS

SeaFALLS deployments typically involve three instruments all manufactured by Satlantic: the profiler itself, which is based on a SeaWiFS Profiling Multichannel Radiometer (SPMR); SeaSURF, which is an in-water irradiance sensor based on a SeaWiFS Multichannel Surface Reference (SMSR); and SeaBOSS, which is an in-air version of the SMSR. SeaFALLS mesures $E_d$ (OCI-1000 S/N 023) and $L_u$ (OCR-1000 S/N 016) as it falls through the water column, SeaSURF measures $E_d(0^-)$ (OCI-1000 S/N 045), and SeaBOSS measures $E_s(0^+)$ (OCI-1000 S/N 046). Like SeaOPS, SeaFALLS is fitted with a WetLABS minifluorometer and a CT probe.

SeaFALLS receives its power and sends its data via an umbilical cable while the in-water reference floats away from the ship (Waters et al. 1990). The references also receive power and send data over a tethered cable: SeaBOSS, can be mounted on a mast or deployed as a drifting buoy, whereas, SeaSURF is floated away from the boat using a buoyant frame. The ability to get the light instruments far away from the ship minimizes any ship-induced disturbances to the *in situ* light field (Mueller and Austin 1995). Since the profiler and both references can be deployed quickly with only two people, the ship can be stopped when light conditions are optimal. More importantly, the profiler descends at approximately 1 m s$^{-1}$ so a relatively deep

cast can be acquired very quickly (about 3 minutes for a 150 m cast), which means casts can be timed to coincide with clouds moving clear of the sun.

Data telemetry for SeaFALLS is very similar to SeaOPS. A PRO-DCU deck unit (S/N 008) supplies the power for both the profiler and the in-water reference independently. The output voltage is automatically adjusted for the cable length being used. An internal computer shuts down the system under fault conditions while indicating the type of fault. RS-485 telemetry at 19.2 Kbaud is converted in the deck box to RS-232 for input into a microcomputer. A separate PRO-DCU deck unit (S/N 020) supplies the power and telemetry conversion for SeaBOSS. The SeaFALLS data was logged on a Macintosh PowerPC 7300/200 using a software package developed by RSMAS and GSFC. This package, called C-FALLS, functions very similarly to C-OPS. The primary difference is C-FALLS has an option for recording the data in a binary format which is compatible with the Satlantic analysis software package called PROSOFT.

SeaFALLS (and LoCNESS) were deployed from the stern of the vessel, and whenever possible, the ship maintained a headway speed of approximately 0.5 kts. The profiling instrument was carefully lowered into the water and slowly released at the surface until it had drifted clear of any possible shadowing effect. In some wave and current conditions, a short burst from the stern thruster was needed to create enough *prop wash* to push the profiler (and surface reference) away from the stern (this short burst was not forceful enough to move the ship significantly and thereby negatively effect the other instruments that were deployed on wires).

When the profiler reached the desired distance from the stern (30 m minimum), it was ready for deployment. Continued effort was made for preventing the telemetry cable from ever coming under tension; even brief periods of tension on the cable can adversely affect the vertical orientation (tilt) and velocity of the profiler. To ensure this did not occur, the operator always left several coils of cable at the surface. Care was taken not to leave too much free cable in the water, because the cable could move under the ship and become entangled in the propeller or stern thruster intake. To ensure a tangle-free and continuous feed of cable into the water, all of the profiler cable (approximately 300 m) was laid out on deck prior to each case in such a manner as to minimize any entanglements.

The SeaSURF and SeaBOSS references are each attached to a 100 m telemetry cable and deployed from the stern of the vessel on the starboard side (although the latter was usually mounted on a pole on the starboard gantry mast). SeaFALLS is deployed at the same time on the port side. The surface reference is then held at approximately 15 m behind the vessel until SeaFALLS is in the correct position for deployment. When the drop command is given, both instruments are released in unison. The reference cable is paid out freely so that minimal tension is placed on the cable which in turn minimizes reference tilt. When SeaFALLS has reached the point of maximum descent (usually the 1% light level), both instruments are pulled back to their original positions, and are ready to be re-deployed. The same care must be taken with the surface reference cable, i.e., making sure too much cable is not released and that any slack is taken in.

Several experiments were conducted with SeaBOSS to determine how best to cheaply and effectively float an in-air sensor away from the ship while keeping it dry and minimizing tilts. Normally, SeaBOSS is fitted with a foam floatation collar instead of a floatation frame (like SeaSURF). After several trials, an in-water reference floation frame was added to SeaBOSS with bungee isolation chords fitted between the frame and the body of the irradiance housing. The instrument was then deployed in the same fashion as the in-water reference. The only extra detail to remember is that the SeaBOSS iradiance sensor must remain dry, so extra care must be taken when the instrument is lowered into the water.

### 3.4.3 LoCNESS

LoCNESS is not a new instrument per se, but instead, is built up from the SeaOPS components: the DATA-100 (S/N 004) and the two light sensors, OCR-200 (S/N 021) and OCI-200 (S/N 029). Once assembled, LoCNESS is a free-falling unit that looks and functions very similar to SeaFALLS (Fig. 14), and it is deployed in the same fashion. The data acquisition for LoCNESS is the same one used for SeaOPS. The only difference in the software is the orientation selector within the control panel must be changed from the horizontal to the vertical orientation. SeaOPS has two pairs of internal tilt sensors, one pair for when it is oriented horizontally and one pair for when it is oriented vertically; the software switch ensures that the correct set of sensors are being displayed and logged.

The principal advantage of LoCNESS is its cost and flexibility; it can be assembled from relatively low cost components (in comparison to SeaFALLS) and it can be quickly reconfigured, because the radiometers used are not integral to the design. For example, rather than measure $E_d$ and $L_u$, a spare OCI-200 can be used in place of the OCR-200 radiometer and LoCNESS can measure $E_d$ and $E_u$. Of course in comparison to SeaFALLS, there is a commensurate loss in sensitivity, so one of the AMT-5 cruise objectives was to evaluate the capabilities of LoCNESS in comparison to SeaFALLS. This was done by making simultaneous deployments of the two with one another. During most deployments of LoCNESS, data was also collected from SeaSURF, SeaBOSS, and the SeaOPS MVDS irradiance sensor.

### 3.4.4 SQM

The validation of ocean color satellite sensors requires a quantification of the uncertainties associated with *in situ*

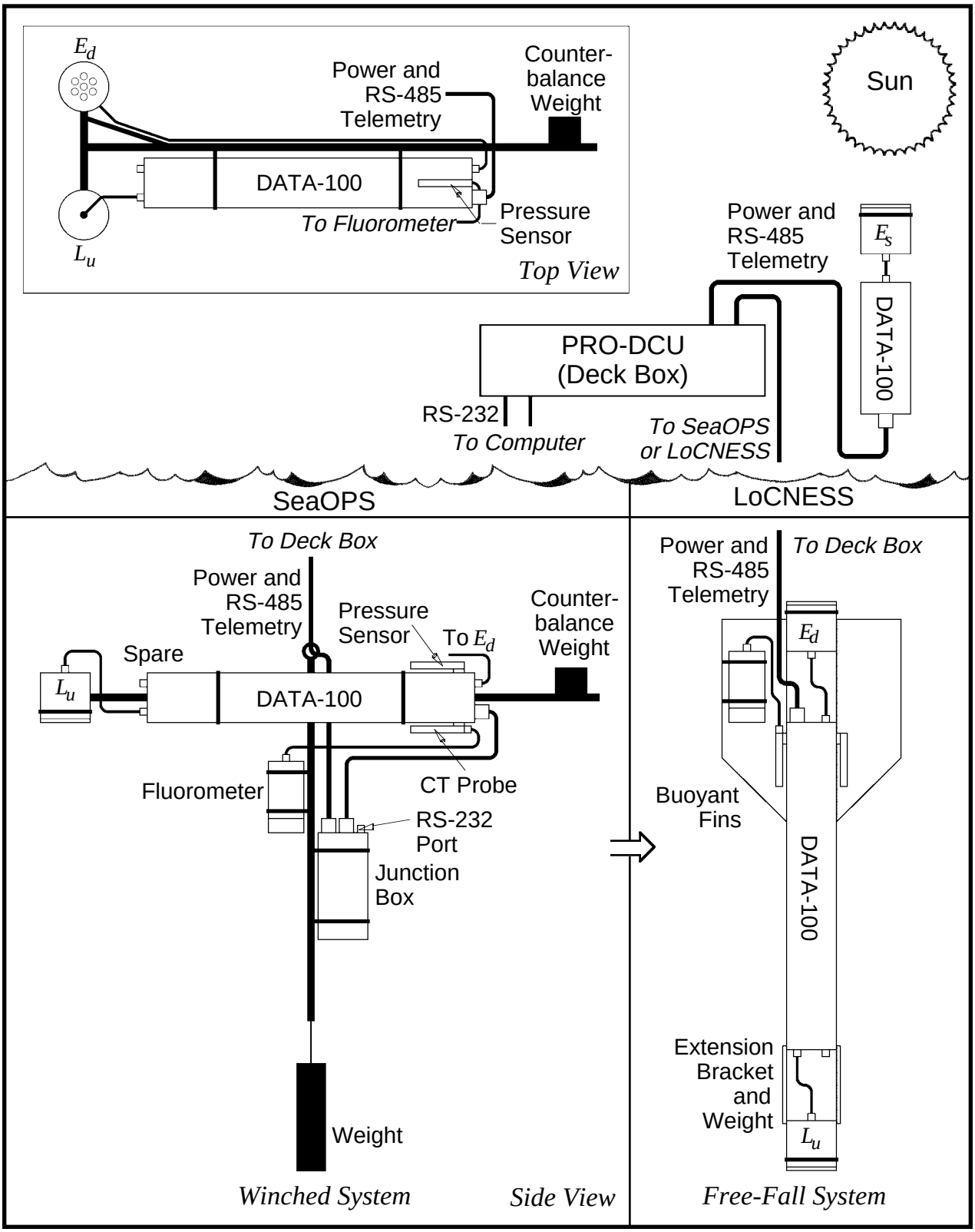


**Fig. 14.** The conversion of SeaOPS into LoCNESS.

radiometric measurements. Presently, there is no convenient way to check or monitor the calibration of a field radiometer while it is being deployed. Consequently, individual investigators have relied either on the manufacturer's calibration data or on pre- and post-cruise calibrations of their instruments. The severe environmental changes encountered by a radiometer during shipment or a long cruise, however, calls into question whether either one of these practices is satisfactory, which in turn raises the concern of the data quality achieved during field deployments.

In response to a demand for an onboard calibration capability, the SeaWiFS Project and the National Institute of Standards and Technology (NIST) jointly designed and constructed a prototype of a portable light source to illuminate various radiometers during oceanographic cruises. This device, called the SQM, produces a diffuse and uniform light field and is designed to be flush-mounted to radiance or irradiance sensors with a spectral range from 380–900 nm (Johnson et al. 1998). The deviation in uniformity of this source is less that 2% over a circular area 15 cm in diameter. To account for changes in the illuminance of the SQM, three temperature-controlled photodiodes measure the exit aperture light level: one has a responsivity in the blue part of the spectrum, another in the red part of the spectrum, and the third has a broad-band response.

The SQM has two banks of subminiature halogen lamps with eight lamps in each bank. For AMT-5, both banks were populated with Gilway model 187 (4.2 V and 1.05 A) lamps. The power supply for the lamps is via two highly regulated Xantrex model HPD 60-5 power supplies. Both power supplies are controlled over a general purpose interface bus (GPIB). The output current values from the power supplies are monitored by measuring the voltages across two precision 1 Ω shunt resistors with a multiplexed Keithley 2000 digital voltmeter (DVM). The DVM voltages are acquired over the GPIB, and the program controlling the power supplies and acquiring the signals converts the resistance values to current and adjusts the output of the power supplies to ensure a constant current supply to the lamps.

Data logging for the SQM involves two computer systems: one for the device under test (DUT) and one for the SQM. Three of the DUTs used during AMT-5 were fiducials, that is, dummy radiometers with different reflective surfaces: a white one, a black one, and a black one with a glass face (made of the same glass used in the Satlantic radiometers). The purpose of the fiducials is to be able to collect data with them before and after actual radiometers as another way of tracking the short- and long-term characteristics of the SQM light chamber as determined by the internal photodiodes.

Whenever the DUT was a field radiometer, a computer system was needed to acquire and log the data from the radiometer. For AMT-5, the UOR and SeaOPS radiometers were logged using the C-OPS software running on a Macintosh PowerBook 3400c computer, and the SeaFALLS radiometers were logged on the same computer using C-FALLS.

The SQM control software is written in LabVIEW and is hosted on a Macintosh PowerBook 5300ce computer. The SQM computer controls the Xantrex power supplies and acquires five other signals from the Keithley DVM: three photodiode voltages from inside the SQM and two voltages across the two shunts. The latter are converted into currents, since the resistance of the shunts is known. All of this information is time stamped and logged into a tab-delimited ASCII file.

## 3.5 Surface Optics

A shipborne, broadband (350–800 nm) spectrograph was built to make measurements of remote sensing reflectance, $R_{rs}$, from which other in-water parameters can be derived. The system is composed of three main parts: a sensing head, a computer control deck box, and a power unit. The total distance between the user and the sensing head was 20 m. The instrument made sequential measurements of incident irradiance and upwelled radiance with an acquisition time of 0.1 s per spectra. It had a spectral resolution of 4 nm and a radiance field of view of 1°. Both sensors were spectrally calibrated at PML using a 1 kW standard lamp. The radiance measurements were made at the Brewster angle, 53° from vertical for seawater, at which reflected light is horizontally plane polarized. A linear polarizer in the vertical orientation placed in front of the radiance optics removed surface reflected light.

The pitch and roll of the ship and the presence of waves meant ideal conditions were rarely realized, so a set of measurements were taken with the polarizer in the horizontal orientation. From this, an estimate of the directly reflected light spectrum was obtained which was then normalized and scaled using the value of the polarizer vertical measurement at 750 nm. This was subtracted from the horizontal signal to give an estimate of the water-leaving radiance. The AMT-5 cruise provided the first opportunity to compare the instrument across a wide range of bio-optical provinces with other optical systems, such as SeaOPS and SeaFALLS, and to make measurements coincident with SeaWiFS overpasses.

Intermittent failures at high temperatures and humidity were overcome by covering the sensing head body with a white cloth and moving the computer deck box from outside to inside the ship. HPLC pigment data were available to compare with chlorophyll concentrations derived with an algorithm which uses the $R_{rs}$ values at 443 nm and 555 nm. Figure 15a shows the values of $K_d(490)$ derived from an algorithm of Moore et al. (1997) which compare closely to those measured directly by SeaOPS. Figure 15b shows the predicted values of chlorophyll concentration against the measured values (top 20 m averaged).

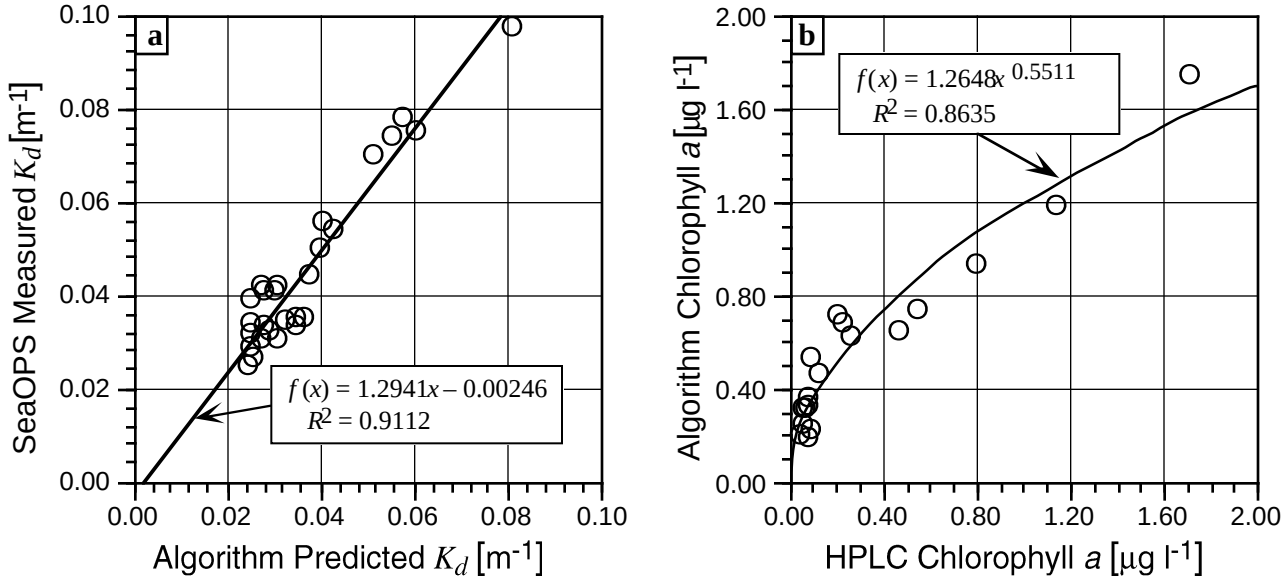


**Fig. 15.** Analysis products relevant to surface optics analysis: **a)** Algorithm was derived from the morning stations data and used to predict the measured chlorophyll from the afternoon stations, and **b)** $K_d$ derived from an algorithm using above surface reflectance compared with *in situ* measurement from SeaOPS.

## 3.6 Sun Photometer

The aerosol optical thickness (AOT) is needed for the vicarious calibration of the radiometric signal recorded at an ocean color satellite. The calibration compares the satellite data with the results of an atmospheric radiative transfer model. Knowing the atmospheric optical properties, the *in situ* measured water-leaving radiances are propagated through the atmosphere to the space sensor. Among the components involved, the aerosol component is the most variable in space and time, and requires an *in situ* estimation.

The main difficulty of the atmospheric correction procedure lies in the retrieval of the AOT and its spectral properties. *In situ* measurements of the AOT are used to evaluate the accuracy of such procedures and validate their operational use. Sun photometry measurements performed during SeaACE provided *in situ* estimates of the AOT at SeaWiFS wavelengths. The development of atmospheric correction algorithms, as evoked above, requires previous knowledge on the spectral attenuation properties of the aerosols (as expressed by the Ångström exponent and coefficient, for example) and on their spatial variability: extensive measurements along AMT-5 transect also contributed to the elaboration of a climatology of the different aerosol types and their properties over this area.

### 3.6.1 Measurement Protocols

Direct sun irradiance was measured using a hand-held sun photometer CIMEL CE317. It allowed measurements at three wavelengths in the visible (centered at 442, 550, and 671 nm), and two in the near-infrared (centered at 783 and 868 nm), having their equivalents in the SeaWiFS waveband set. The instrument was also equipped with a sixth channel at 936 nm. As water vapor absorption is very weak at the SeaWiFS wavelengths, no use was made here of this supplementary wavelength for water vapor absorption correction purposes.

Measurements were performed by manually pointing the collimator at the sun and moving it across the solar disk; the *peak hold* function allowed the retention of the measured maximal value. This operation was repeated sequentially for each wavelength. In addition, GMT time and internal temperature recordings were made at the end of each measurement sequence, which lasts about one minute. Taking into account the sequential logging of data, the specific acquisition time for each channel was extrapolated from the GMT time recording. The estimated error on the resulting absolute time was less than 10 s. This error was only relevant in situations of very low sun elevation, i.e., when the sunlight path across the atmosphere varied in a non-negligible way during a measurement sequence. The dark signal (taken by masking the collimator) was recorded regularly, especially in situations of high external temperature in tropical and equatorial regions. A dark signal different from 0 digital counts was never observed.

Before the AMT-5 cruise, the instrument was calibrated (using the Langley method) at sea level (near Ispra, Italy) to derive the total optical thickness from the digital counts registered by the instrument for the six sampled wavelengths. These calibration coefficients were used for the data presented herein. Some improvements, in particular a higher accuracy in the retrieved AOT values, would be expected from a calibration done at a high altitude

(above 3,000 m). Nevertheless, the measurements for the AMT-5 cruise, made on very clear days and relatively extended air mass range, showed similar calibration coefficient values (within 0.1–0.7%), except for the blue channel for which values were about 1.5% lower. A sensitivity analysis showed that a 1% error on the calibration coefficients would lead to a maximum misestimation globally of about 0.01 in the retrieved absolute value of the AOT.

In general, during the day and underway, measurements were taken as soon as conditions of clear sun were encountered. As far as possible, double or triple consecutive measurement sequences were taken in order to assess any short time scale variability of the atmospheric conditions.

In situations of clear sky all day long, measurements were made at a frequency of 10–30 min, depending on the sun elevation. During optics station and SeaWiFS overpasses (generally close to one another) the frequency was, if possible, increased (every 5–10 min), particularly in situations of unstable illumination (broken clouds passing rapidly, high cirrus, etc.). Obviously, no unique strategy could be adopted as readings depended on clear sky conditions. Some measurements were deliberately taken in situations of high thin cirrus masking the sun (they are not documented in this document).

Appendix F is a table of the measurements recorded during the cruise and retained for the present study, together with their correspondence with optics stations. A written log containing comments on the quality of the associated atmospheric conditions was maintained for each measurement sequence. An *a posteriori* cleaning of the data set has been based on these comments. Additional variables needed for the data processing, as ship geographic position and atmospheric pressure, were downloaded from the ship log data streams.

### 3.6.2 Data Processing

When solar radiation enters the Earth's atmosphere a part of the incident energy is attenuated through scattering and absorption processes. For a wavelength $\lambda_i$, the solar irradiance $E$ measured at an observation point (here the sea level) can be expressed as a function of the extraterrestrial solar irradiance $E_0$ as:

$$E(\lambda_i) \;=\; E_0(\lambda_i)e^{-\tau(\lambda_i)m}, \qquad (1)$$

where $\tau$ is the atmospheric total optical thickness and $m$ the relative air mass. Air mass was computed according to Karsten (1966):

$$m \;=\; \left[\cos\left(\frac{\theta}{57.296}\right) + 0.15(93.885-\theta) - 1.253\right]^{-1}, \qquad (2)$$

where $\theta$ is the sun zenith angle (a function of latitude and solar time).

By knowing $E_0$ (the aim of the Langley calibration was to determine the $E_0$ value in digital counts measured by the instrument) and measuring $E$ (the present measurements in digital counts), $\tau$ can then be derived. In the absence of absorption by water vapor and uniformly mixed gases, $\tau$ can be decomposed into the sum of the optical thickness specific of each major optical components of the atmosphere (at the wavelengths of interest):

$$\tau \;=\; \tau_R \;+\; \tau_O \;+\; \tau_A, \qquad (3)$$

where the $R$ subscript stands for the Rayleigh component (molecules of the air), $O$ for the ozone, and $A$ for the aerosols, respectively. When $\tau_R$ and $\tau_O$ is known or computed, $\tau_A$ can consecutively be obtained. $\tau_R$ has been computed here according to Fröhlich and Shaw (1980) revised by Young (1980) and introducing the altitude dependence (Marggraf and Griggs 1969):

$$\tau_R(\lambda_i) \;=\; \frac{P}{P_0}0.00864\,\lambda_i^{-\delta}e^{-0.1188H-0.00116H^2}, \qquad (4)$$

where $P$ is the atmospheric pressure at the observation point and $P_0$ is the standard atmospheric pressure at sea level, $\delta = 3.916 + 0.074\lambda_i + 0.050\lambda_i^{-1}$, and $H$ is the altitude (in kilometers) of the observation point. $\tau_O$ has been derived from a climatology of the atmospheric ozone concentration $C_O$ (Robinson 1966) and the spectral absorption coefficient for ozone $a_O^*$ (Leckner 1978 and Vigroux 1953),

$$\tau_O(\lambda_i) \;=\; C_O a_O^*(\lambda_i). \qquad (5)$$

The wavelength dependency of the aerosol optical thickness, $\tau_A$, is commonly expressed by the Ångström law (Ångström 1961) as,

$$\tau_A(\lambda_i) \;=\; \beta\lambda_i^{-\alpha}, \qquad (6)$$

where $\alpha$ and $\beta$ are the Ångström exponent and coefficients, respectively.

They have been computed here by a least squares fit of the estimated $\tau_A(\lambda_i)$ versus $\lambda$ in the wavelength intervals 440–870, 440–670, and 670–870 nm as a matter of comparison, the spectral behavior of $\tau_A$ being generally different from the visible part to the near-infrared part of the spectrum. For a set of $\alpha$ and $\beta$ values, $\tau_A$ can then be computed at each SeaWiFS wavelengths.

In situations of low aerosol optical thickness, a maximum has been systematically observed at 783 nm, of relatively constant amplitude equal to about 0.01 (in situations where $\tau_A(783)$ is higher than about 0.1 this effect is masked). Such a particular spectral behavior cannot be explained by any physical properties of aerosols and must be interpreted as an artifactual effect. The two following hypotheses for its explanation have been successively rejected:

i) A non-negligible source of attenuation, like water vapor or uniformly mixed gases, was omitted in the decomposition of the total optical thickness into separate components (2). However, computations performed with the 5S code (Tanré et al. 1990) for uniformly mixed gases and with Iqbal (1983) for 1 cm of water vapor showed that the sum of the optical thickness of both components is negligible at that wavelength (about 0.0015 in the extreme case).

ii) Calibration coefficients have been badly estimated for that specific wavelength. In such a case, the amplitude of the observed peak should show a dependence with the intensity of the aerosol optical thickness at 783 nm itself or with the air mass. Actually, this is not the case.

An instrumental problem (such as a nonperfect monochromatic transmission of the filter) may be a cause for this observation. The correction procedure used here is as follows: a constant value of 0.009 was subtracted from the measured $\tau_A(783)$. This value was obtained by averaging the observed difference between the measured AOT at 783 nm, $\tilde{\tau}_A(783)$, and the estimated one, $\hat{\tau}_A(783)$, using the Ångström law parameters computed for the pair [$\tau_A(671)$,$\tau_A(868)$]. The corresponding standard deviation around the mean was equal to 0.003.

### 3.6.3 Preliminary Results

Figure 16 shows the AOT ($\tau_A$) at SeaWiFS nominal wavelengths along the cruise transect computed for each individual measurement using the Ångström law (6) and the two coefficients ($\alpha$, $\beta$) estimated for 412, 443, 490, and 510 nm (panels a–d) and 555, 670, 765, and 865 nm (panels e–h).

High values (between 0.30 and 0.55 at 443 nm) of the AOT were observed in the Southern Hemisphere around the equator (0–10°S) for hazy sky situations (Fig. 16). In the Northern Hemisphere, high values of 0.15–0.25 at 412 nm were observed around 20°N in the area possibly influenced by Saharan dust (note the corresponding low values, around 0.5, of the Ångström exponent for the 442–671 nm interval, Fig. 17). The lowest aerosol atmospheric loads were observed south of 50°S near the Falkland Islands. There was non-negligible variability (at small scale) of the $\tau_A$ values shown by the measurements performed on a restricted distance (one measurement day), e.g., $\tau_A(443)$ varies between 0.40–0.55 around 10°S (Fig. 16).

Although they are globally correlated, the Ångström exponents computed for the visible range (442–671 nm) are generally higher than those computed for the near-infrared range (671–868 nm), (Fig. 17). Although the calibration coefficients used for the aerosol optical thickness estimates have not been obtained in ideal conditions, the data presented here can be considered reliable. They may be subject to small readjustments, mainly for situations where the aerosol content was low, when more accurate coefficients are obtained from a high altitude calibration experiment.

## 3.7 UOR Optics and the FRRF

A UOR 800 series (Nu-Shuttle) was towed most days throughout the transect, except when the vessel was making high speed passage at 15 kts. The undulator carried an FRRF (Chelsea Instruments) which logged data into an internal flash memory card and additional sensors for temperature (PRT), and conductivity (SBE), plus downwelling irradiance and upwelling radiance (Satlantic OCI-200 and OCR-200). The signals from these devices, plus the analog signals from the FRRF, were logged by a PML data logger (S/N JA8 or S/N JA10). The UOR was deployed once per day, after the morning station and recovered just before the afternoon station.

The UOR was towed on 250–270 m of cable at 11–12 kts with a programmed depth range of 3–55 m undulating over a cycle of 288 s; the 1 Hz logging rate gave a depth resolution of approximately 0.2 m. This depth range was optimal for the irradiance and radiance measurements and near optimal for the FRR fluorometry in most waters. There were a number of equipment failures (data loggers re-setting) which led to the loss of some data. After early problems with the FRRF, including a broken connector on one unit, the instrument performed reliably and data were acquired in a wide variety of waters of different productivities (Appendix H). None of the data were analyzed at sea.

Several FRRF experiments were carried out on deck by submersing the instrument in a tank filled from the ship's nontoxic supply. Filters that simulated the light at different depths were placed over the tank sequentially so as to measure the phytoplankton photosynthetic characteristics at different light intensities. The FRRF was used in waters that were close to or below its lower limit of capability of 0.1 mg $l^{-1}$ found in the oligotrophic gyres. After experimenting with various protocols, data analysis suggested that by increasing the gain and the number of repetitions or sequences, the signal-to-noise ratio could be improved. In the more productive parts of the Southern Ocean, the gain setting was reduced to prevent the saturation of the signals. These data will help define the operational protocols to exploit the performance of the instrument efficiently, for the wide range of ecosystems encountered on AMT cruises.

Expendable optical, temperature, and depth probes (XOTD) were deployed after every morning station before the UOR deployments. The XOTD system recorded data on scattering and temperature to over 400 m (Appendix G).

## 3.8 Seawater Filtration

Seawater was drawn from the nontoxic seawater supply every 2 h and filtered for subsequent analysis for phytoplankton pigments. All water was collected into clean

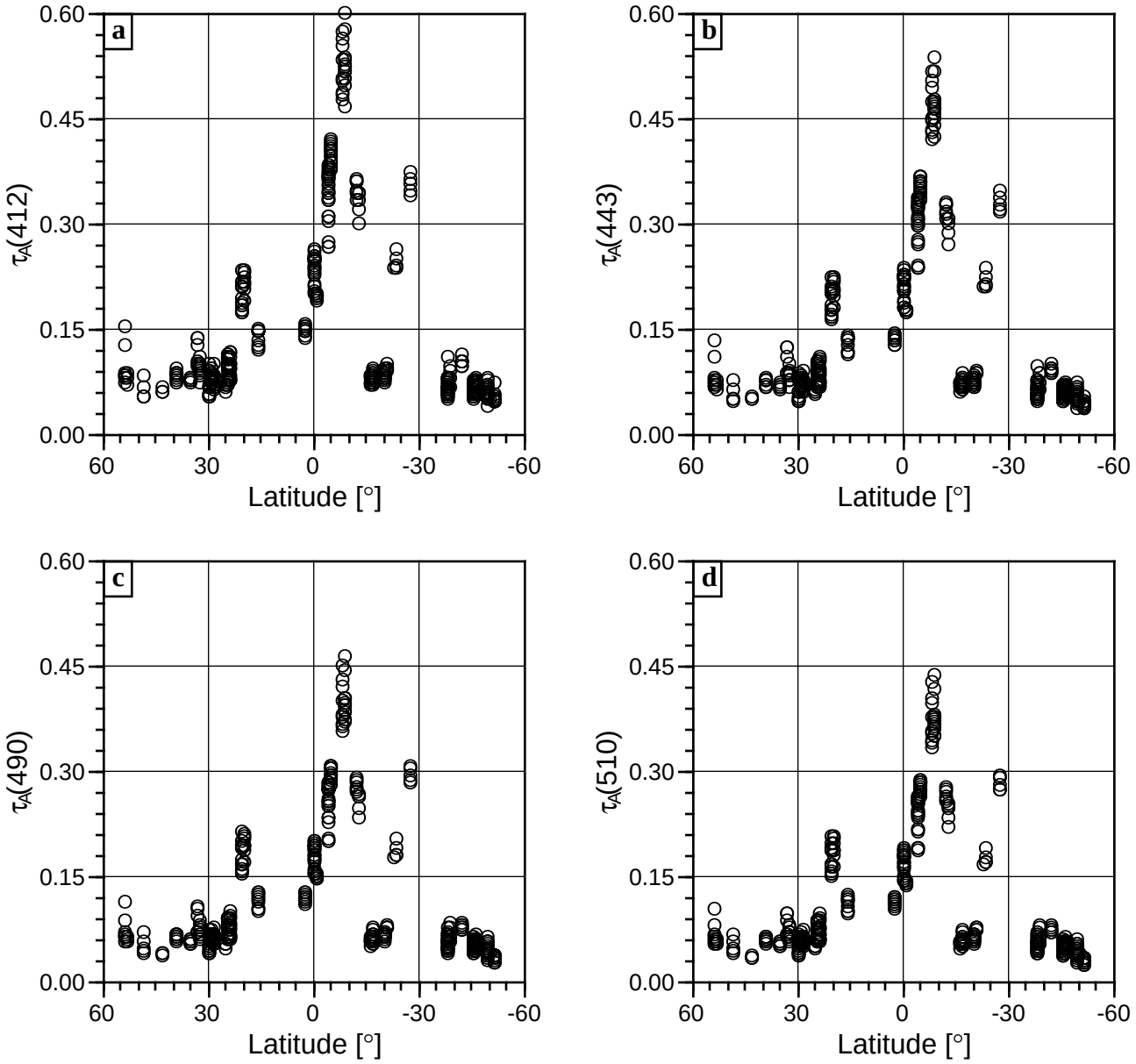


**Fig. 16.** AOT along-track values for **a)** 412, **b)** 443, **c)** 490, and **d)** 510 nm.

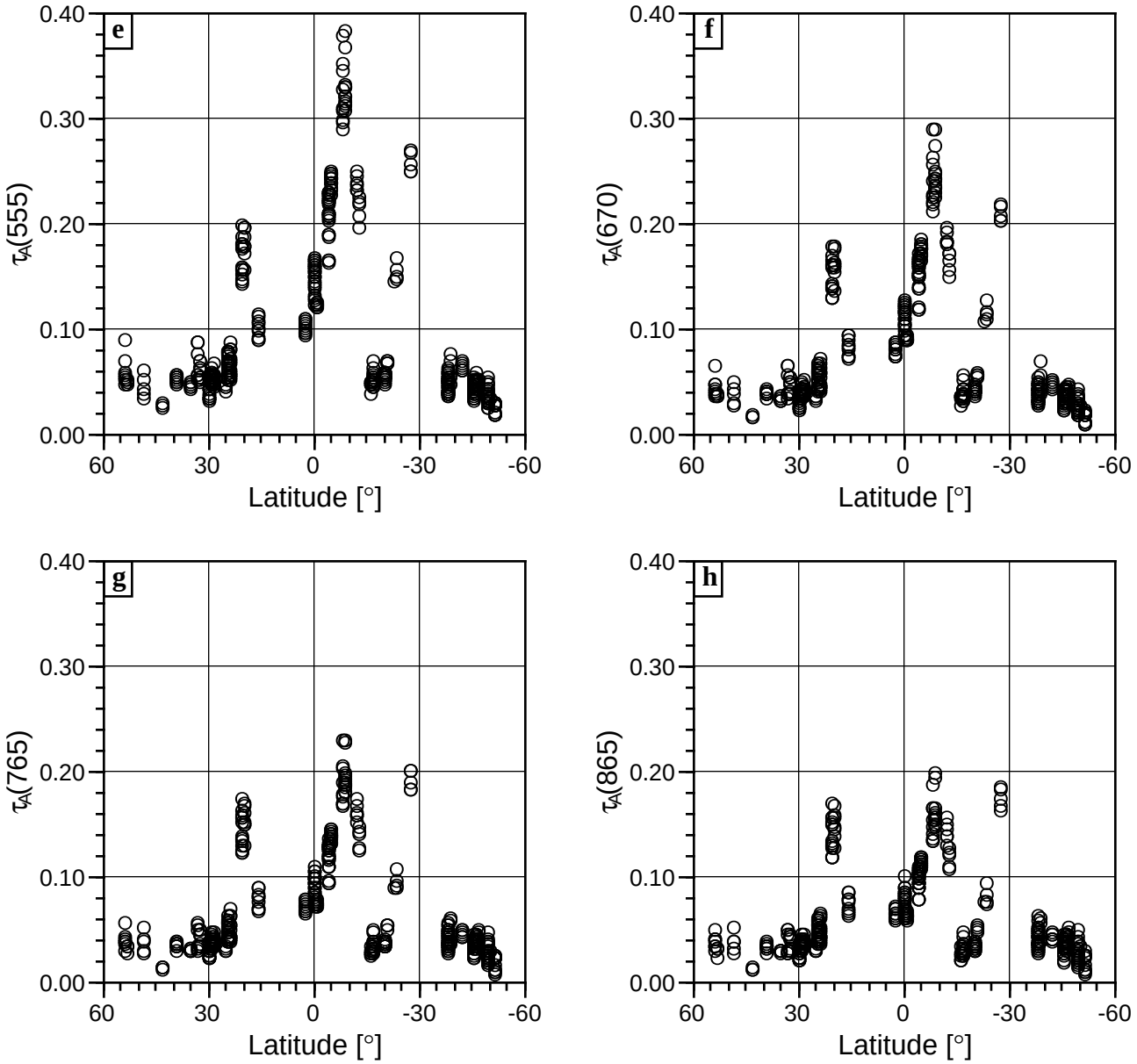


**Fig. 16. (cont.)** AOT along-track values for **e)** 555, **f)** 670, **g)** 765, and **h)** 865 nm. Note the change in amplitude in the $y$-axis values (especially with respect to Figs. 16a–16d.

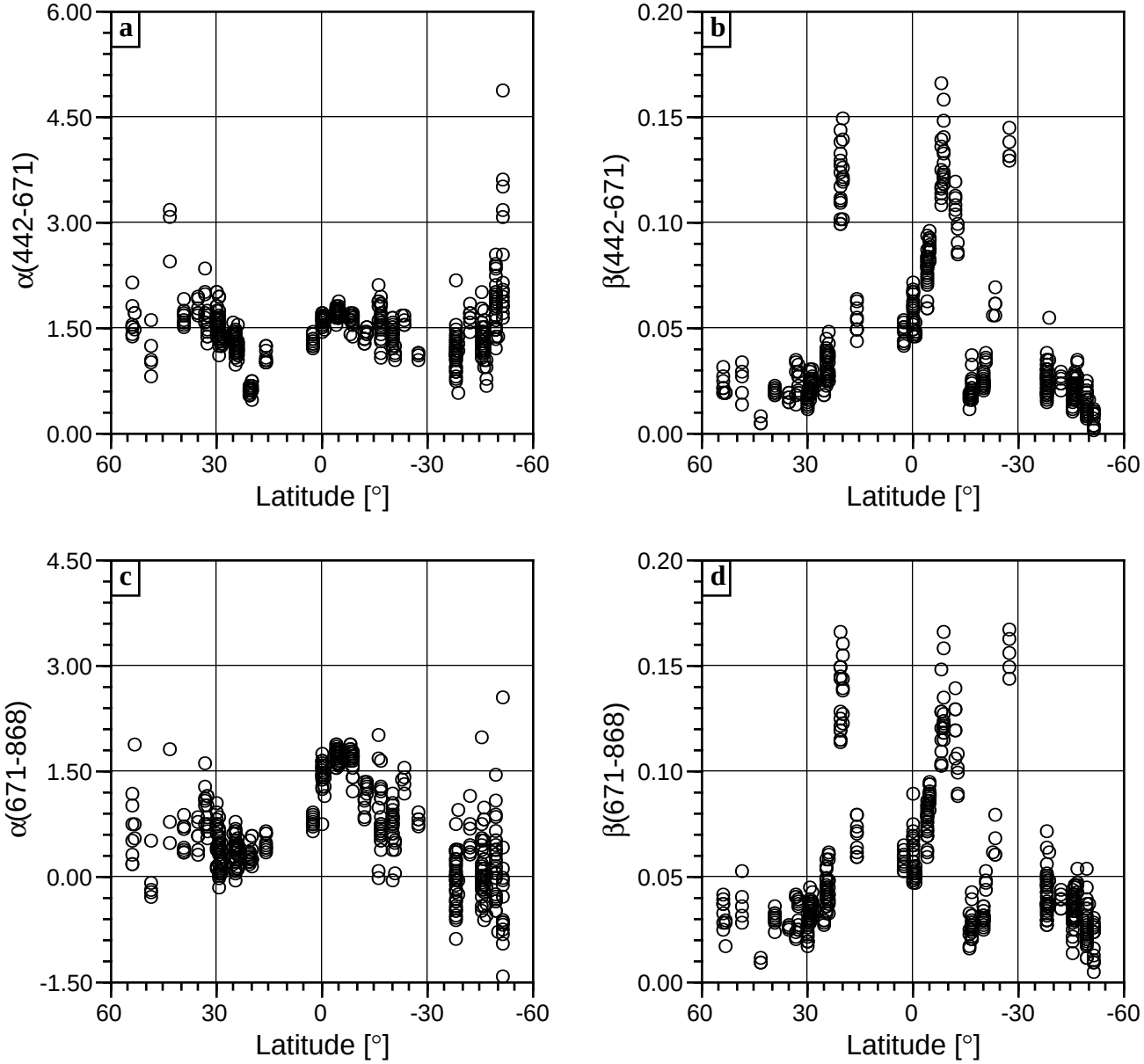


**Fig. 17.** Along-track values for **a)** $\alpha$ (442–550–671 nm), **b)** $\beta$ (442–550–671 nm), **c)** $\alpha$ (671–783–868 nm), and **d)** $\beta$ (671–783–868 nm).

10 l containers before being split into smaller 2.15 l bottles for filtration. The overall volume of water that was filtered for each sample was dependent on the time taken for samples to pass through the filter, i.e., a function of the concentration of particulates within each sample. All volumes of water, in addition to values of surface salinity, temperature, fluorescence, time (GMT), latitude, and longitude observed at the time of collection for each sample are given in Appendix I.

The seawater samples were filtered through Whatman GF/F filters. These individual filters were placed into cryovials using forceps. Several replicates for each sample were taken in order to separately analyze chlorophyll *a* and accessory pigments by fluorometric and HPLC techniques, respectively. All replicates were immediately stored at −80°C until subsequent analyses. One set of replicates from each sample was transferred into liquid nitrogen after accumulation in the −80°C for 1–2 d. This set of replicates was shipped back to the UK, Italy, and the USA for later HPLC analysis.

Seawater was drawn from each CTD that was deployed. Water was collected from 10–12 depths corresponding to each CTD fluorometer profile signature, and subsequently processed for phytoplankton pigments as described above. The volume of water that could be filtered was often dependent on the amount available; hence, all quantities are displayed in Appendix I for all CTD stations.

Seawater from each depth was collected for future analysis of picoplankton. Two 1 ml samples were drawn from each water bottle using a bubble pipette and placed into a corresponding cryovial. To each vial, 30 $\mu$l of 25% glutaraldehyde was added. Samples were then incubated for 10 min before being frozen in the −80°C freezer.

## 3.9 Phytoplankton Pigment Distributions

Chlorophylls and carotenoids, the key light harvesting pigments in phytoplankton, are central to the introduction of energy into oceanic ecosystems and, thus, mediate the biogeochemical cycles of carbon, nitrogen, and oxygen. In the oceans, the photosynthetic pigments, particularly chlorophyll *a*, have long been recognized as unique molecular markers of phytoplankton biomass.

Although the distribution of chlorophyll *a* has traditionally been studied using spectrophotometry and fluorometry (Holm-Hansen et al. 1965), both methods suffer from inaccuracies associated with spectral interferences from chlorophyll *b*, carotenoids, and from chlorophyll *a* degradation products (for example, chlorophyllides, phaeophytins, and phaeophorbides) which may occur during senescence, grazing, sedimentation, and resuspension of phytoplankton (Mantoura et al. 1997). The application of HPLC provides a more accurate estimate of chlorophyll *a* and the rapid separation and quantification of up to 50 additional chloropigments and carotenoids in marine plankton (Wright et al. 1991 and Jeffrey et al. 1997).

Many pigments have strong chemotaxonomic associations which may be exploited to map the oceanographic distribution and taxonomic composition of the phytoplankton community. For example, 19′-hexanoyloxyfucoxanthin is used as a biomarker of prymnesiophytes (Bjornland and Liaaen-Jensen 1989), while fucoxanthin has been used as a marker for diatoms (Barlow et al. 1993). More recently, the discovery of divinyl chlorophyll *a* and chlorophyll *b* (Chisholm et al. 1988), which are highly specific marker pigments of prochlorophytes, has improved the understanding of picophytoplankton (size 0.2–2 $\mu$m) in subtropical and tropical oligotrophic oceanic waters, which are likely to account for a significant component of primary production in the world ocean (Partensky et al. 1993).

Characterizing the spatial and temporal variability of phytoplankton abundance and composition is a crucial step in understanding and quantifying the fluxes and processes involved in oceanic biogeochemical cycling. With the advent of remote sensing, ocean temperature and color can now be monitored from space (Aiken et al. 1992) allowing algal biomass and, hence, aspects of biogeochemical cycling to be studied on a global scale.

### 3.9.1 HPLC Methodology

The objectives of the HPLC analysis activity were to map the distribution of phytoplankton pigments along the AMT cruise transect in vertical profiles and in surface waters using HPLC with high sensitivity diode array detection, and to use these data to:

1. Map, along the AMT transect, the chemotaxonomic distribution of phytoplankton;
2. Provide ground truth data for the development of SeaWiFS remote sensing algorithms and provide an accurate pigment database for the calibration of fluorescence and optical sensors;
3. Determine regional absorbance characteristics and basin-scale variations in phytoplankton biomass and community structure to partition the North and South Atlantic Ocean into well-characterized ocean-break ographic provinces; and
4. Assess the taxon-specific production of simultaneously determined biogenic gases and, thus, provide an evaluation of the utilization of phytoplankton pigments as proxy markers for these climatically important species.

Seawater samples were collected from the CTD water bottles (10 depths) and from the nontoxic supply at 2 h intervals. Phytoplankton were harvested by filtering 1–6 l samples through 25 mm GF/F filters using positive-pressure filtration, and the pigment extracted from the filters into 90% acetone with the aid of ultrasonication. Extracts were centrifuged and filtered through Teflon syringe filters to remove debris. Extracts were then analyzed for chlorophyll using a Turner Designs 10-AU fluorometer and

for a range of chlorophyll, carotenoids, and phaeopigments by reverse phase HPLC.

Extracts were held at 2°C in an autosampler unit, and vortex mixed with ammonium acetate buffer (1:1 v/v) before injection. Pigments were separated on a C-8 column using a binary mobile phase system with linear gradient (methanol/1.0 M ammonium acetate; 100% methanol; Barlow et al. 1998). Pigments and phaeopigments were detected by absorbance at 440 nm and 667 nm, respectively, using diode array detection. Pigment identity was secured by co-elution with authentic pigments (VKI, Denmark) and confirmed through spectral correlation with standard UV-visible spectra (300–750 nm). Pigments were quantified with respect to a canthaxanthin internal standard via relative response factors, while phaeopigments were quantified using response ratios. As well as the resolution of key chemotaxonomic chlorophyll and carotenoid pigments, baseline separation of monovinyl and divinyl chlorophyll *a*, and lutein and zeaxanthin, and partial separation of monovinyl and divinyl chlorophyll *b* was achieved in a total analysis time of less than 30 m.

Replicate seawater samples were filtered through GF/F filters for the determination of fluorometric chlorophyll. Chlorophyll was extracted from the filters into 90% acetone and quantified using a fully calibrated Turner Designs 10-AU fluorometer using the method of Welschmeyer (1994).

### 3.9.2 HPLC Achievements

Samples were collected, processed, and analyzed on board from all CTD stations and from underway samples collected at 2 h intervals. Data were processed and made available to the scientific party and transferred to SeaWiFS Project on a daily basis. Figure 18 demonstrates the relationship between fluorometrically determined chlorophyll *a* and HPLC total chlorophyll *a*.

Depth profiles, at two contrasting stations, are illustrated in Fig. 19; this figure shows the distribution of chlorophyll *a* (biomass), divinyl chlorophyll *a* (prochlorophytes), hex-fucoxanthin (prymnesiophytes), fucoxanthin (diatoms), and zeaxanthin (cyanobacteria).

## 3.10 Productivity

Over the course of the AMT-5 cruise track, which covered a wide range of marine ecosystems, primary production was estimated by incorporating radioactive $^{14}C$ by phytoplankton during photosynthesis. Primary production is constrained by physiological, ecological, and environmental factors, such as nutrients or light availability. To describe the size structure of the community, the primary production the biomass were fractionated into three size fractions: picoplankton (less than 2 $\mu$m), nanoplankton (2–20 $\mu$m), and net-plankton (greater than 20 $\mu$m).

The taxonomic diversity of phytoplankton assemblages is a crucial determinant of the carbon flux in any oceanic region. Diatoms possess higher growth potential compared to flagellates when nutrients are available (Furnas 1990). In addition, grazing controls of phytoplankton production are more likely to occur when algal size is small (Kiorbe 1993). Irradiance is a critical factor affecting the amount of carbon fixed into organic compounds and photosynthesis-irradiance (P-I) experiments can indicate different strategies of energy utilization by marine phytoplankton.

The objectives of the productivity experiments were to:

1. Describe the meridional distribution of size-fractionated phytoplankton abundance and taxonomic composition;
2. Determine the patterns of meridional distribution of photosynthetic rates in three different size fractions (picoplankton, nanoplankton, and net-plankton);
3. Characterize the meridional and vertical variability of the photosynthetic parameters of the microalgal assemblages and their relationship with the physical and chemical factors;
4. Determine the production of dissolved organic carbon (DOC) in the Azores area and determination of total organic carbon (TOC) along the latitudinal transect; and
5. Determine the community net production in relation to the community structure and to quantify the balance between production and respiration in the photic layer.

### 3.10.1 Methodology

Water samples collected from the CTD bottles at 5 or 6 depths at each station were used for all of the standing stock and rate measurements. Size-fractionated chlorophyll *a* concentration was determined fluorometrically, with a Turner Designs 10 AU Fluorometer, after sequential filtration of a 250 ml sample through 20 $\mu$m, 2 $\mu$m, and 0.2 $\mu$m polycarbonate filters and subsequent extraction in 90% acetone at −20°C overnight. The fluorometer had been set up to use the nonacidification technique of Welschmeyer (1994). Water samples from the surface and the DCM at each station were preserved with formalin and lugol's iodine for microplankton species identification and counting.

#### *3.10.1.1 Primary Production*

Vertical profiles of size-fractionated primary production were obtained from $^{14}C$ incubations on deck with a range of filters for 10 irradiances from 97% to 1% of the surface volume. Triplicate water samples in 70 ml polycarbonate bottles, were spiked with 10 $\mu$Ci $NaH^{14}CO_3$ and incubated for 6.5–7.5 h at an irradiance close to that of their original depth, as determined by the optical profile from the PAR sensor on the CTD. At the end of the incubations, samples were filtered sequentially through 20 $\mu$m, 2 $\mu$m, and 0.2 $\mu$m polycarbonate filters. Filters were exposed to concentrated HCl fumes for 12 hours to remove

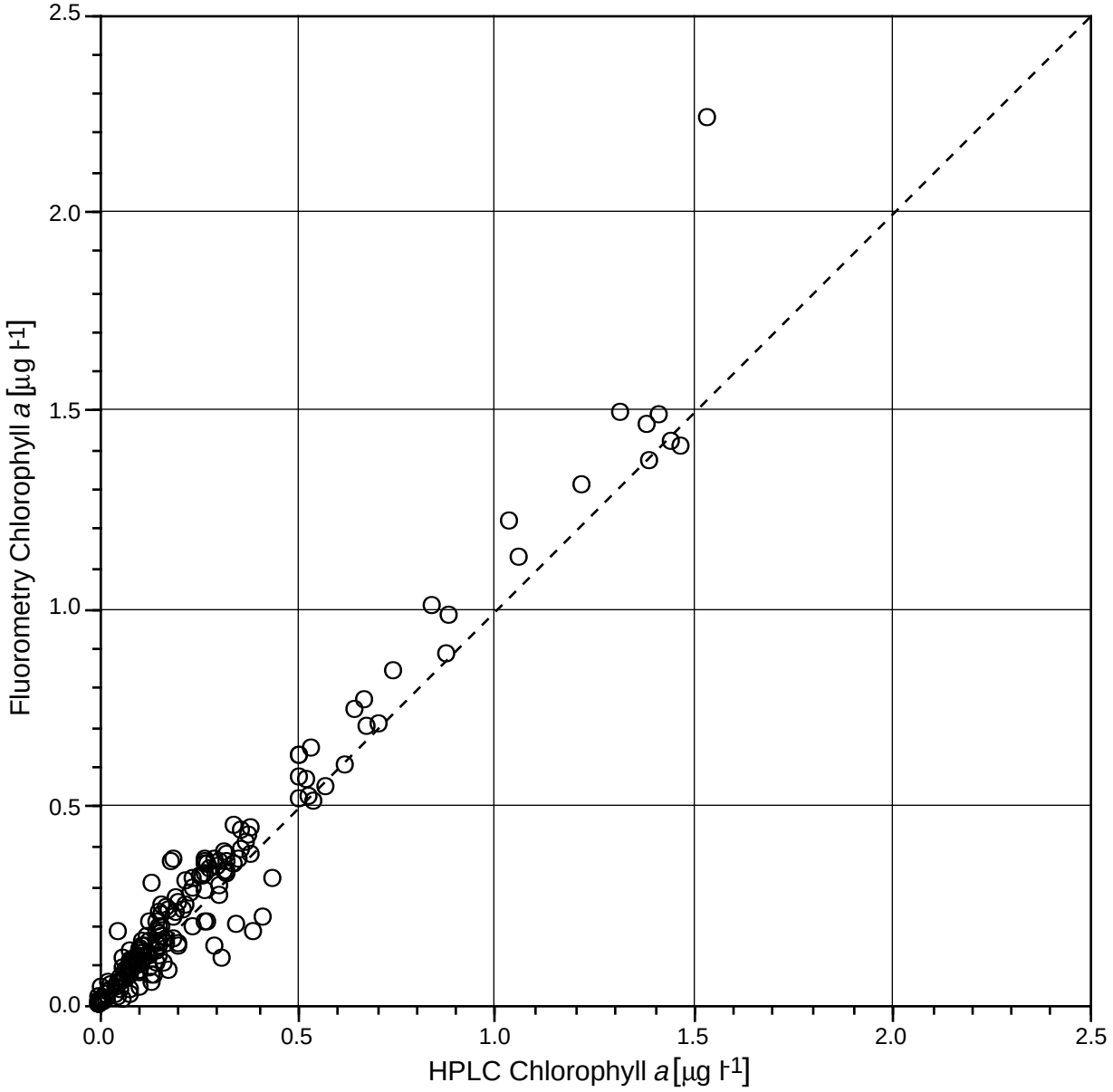


**Fig. 18.** The correlation of fluorometrically determined chlorophyll $a$ and HPLC total chlorophyll $a$ [$f(x) = 0.8809x + 0.00883$ and $R^2 = 0.9555$].

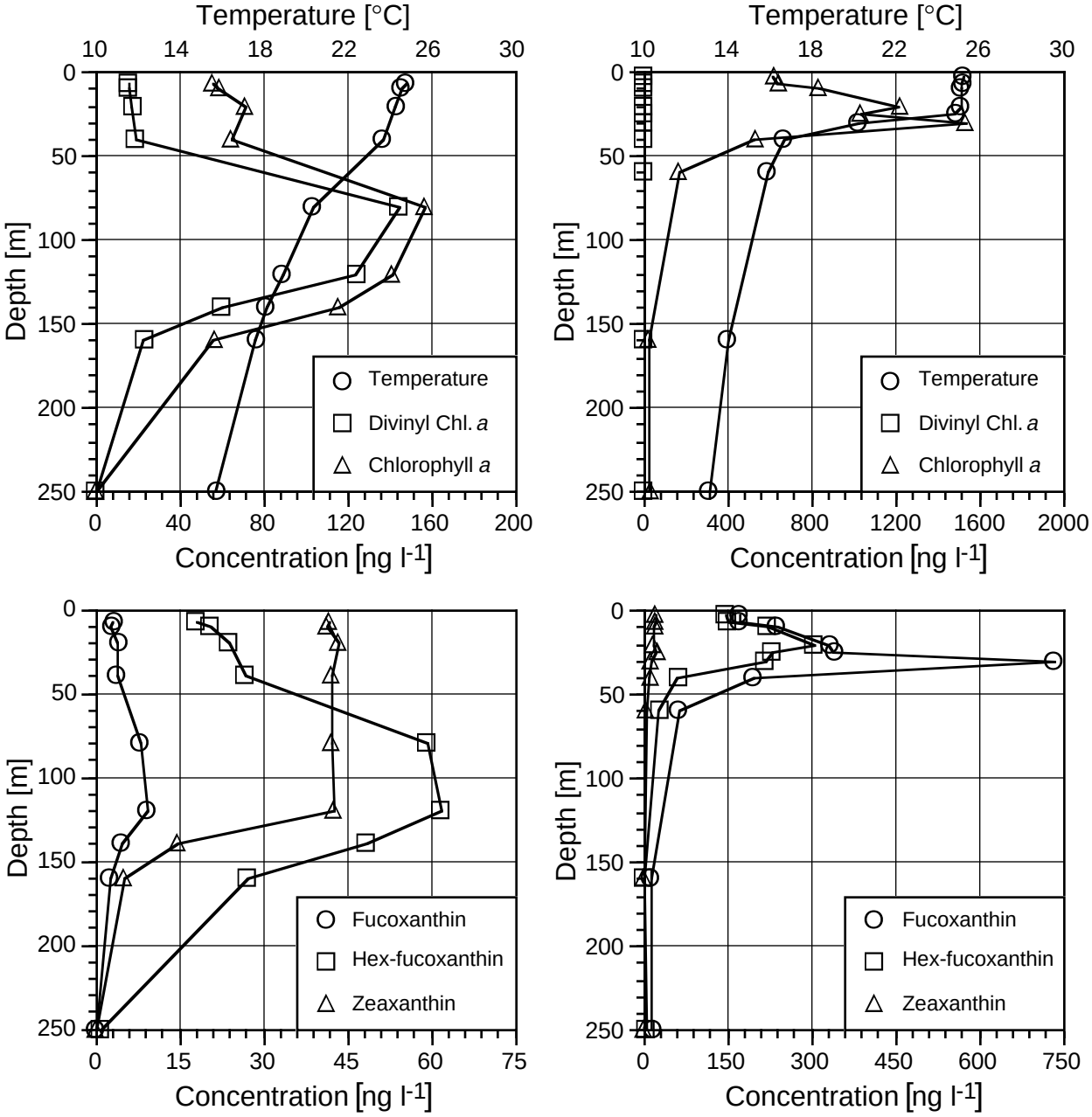


**Fig. 19.** Depth profiles of chlorophyll *a*, divinyl chlorophyll *a*, fucoxanthin, hex-fucoxanthin, and zeaxanthin at CTD Stations 9 (left two panels) and 11 (right two panels).

inorganic $^{14}C$. The radioactivity of each fraction was determined on a Beckman liquid scintillation counter after the addition of 3.5 ml scintillation cocktail to each vial.

Photosynthesis-irradiance (P-I) experiments were carried out with bench incubators equipped with 100 W halogen lamps which provided a range of light intensities. At two depths (the surface and the DCM) for each station along the transect and at three depths (surface, DCM, and an intermediate depth) at 6 stations in the Azores area, water samples were collected for P-I experiments. The samples were cooled using the surface water supply. The incubations lasted for 2–2.5 hours, after which each sample was filtered through a 0.2 $\mu$m polycarbonate filter, decontaminated, and counted as described above.

#### *3.10.1.2 Dissolved Organic Carbon Production*

DOC production was determined at three depths on each station in the Azores area. Triplicate water samples in 30 ml glass bottles, were spiked with 75 $\mu$Ci $NaH^{14}CO_3$ and incubated on deck for 2–3 h at an irradiance level close to the original level experienced by the phytoplankton cells. At the end of the incubation, 10 ml of each sample was filtered by glass microfibre filters (GF/F). The filtrate was acidified with phosphoric acid to a pH level of 2, the samples were stirred for 24 h to remove inorganic $^{14}C$, and 14 ml scintillation cocktail were added to each vial. The GF/F filters were exposed for 12 hours to concentrated HCl fumes, to remove inorganic $^{14}C$, and then placed in vials with 3.5 ml scintillation cocktail for the determination of radioactivity using a Beckman liquid scintillation counter.

#### *3.10.1.3 Total Organic Carbon Production*

Samples were collected for determining TOC for 10 stations within the CANIGO area, the same stations for which DOC production experiments were performed. Because of the extremely low particulate organic carbon (POC) levels in open ocean waters, the samples were not filtered on board while at sea, since contamination during filtration is one of the main sources of error in DOC measurements. Triplicate seawater samples were drawn directly into 10 ml glass ampules (ashed 450 °C, 12 hours). After acidification with phosphoric acid to a pH of 2, the ampules were heat-sealed and preserved in the dark at 4°C, the most convenient and practical method for TOC preservation for long periods. The samples will be analyzed in the next few months by the high temperature catalytic oxidation (HTCO) technique, at the laboratory of the *Instituto de Investigaciones Marinas*, in collaboration with Vigo University.

#### *3.10.1.4 Respiration and Net Production*

Along the latitudinal transect at three depths on each station (55% and 1% light depths and the DCM), water samples were taken for oxygen analysis. The incubation procedure used was the same as that employed for primary production. Three kinds of experiments, each with 6 replicates, were performed: one to measure the initial oxygen concentration, another for the oxygen respired, and a third for the phytoplankton production. The analysis used the potentiometric Winkler technique with end point detection.

### 3.10.2 Preliminary Results

For most of the AMT-5 transect, the total chlorophyll concentration within the surface mixed layer was less than 0.4 mg m$^{-3}$. In two areas, however, the total concentration was higher: greater than 1.4 mg m$^{-3}$ in the African upwelling, and more than 0.8 mg m$^{-3}$ within the latitudinal range 30.617–42.233°S. In the oligotrophic areas, where the phytoplankton abundance was low, most of the chlorophyll *a* was associated with the picoplankton size class. In contrast, the contribution of the net-plankton (greater than 20 $\mu$m) size class to total chlorophyll *a* was high in those areas with relatively high levels of microalgal abundance. The vertical distribution of chlorophyll *a* showed a maximum located in the thermocline. This DCM reflected photoadaptation of microalgae to low irradiance, producing enhanced levels of cellular chlorophyll *a*, rather than a biomass maximum.

All of the curves from the light-saturation experiments have been plotted, although, statistical fitting to the appropriate models has yet to be completed. The results presented in this report, therefore, are only to be considered as preliminary. The light saturated rate of chlorophyll *a*-specific photosynthesis varied widely throughout the cruise and with depth. Higher values were always found in the surface populations except in the bloom station (located at 48.867°W,35.483°S). Photoinhibition was present in most samples from the DCM, indicating photoadaptation to low light levels. When statistical analysis is complete, the latitudinal and vertical variability of the P-I parameters will be compared to the distribution of other variables, such as, temperature, nutrient concentration, and phytoplankton composition.

## 3.11 Nutrients

The objectives of the micronutrient and nanonutrient analyses were to:

1. Study the spatial and temporal variations of the micronutrients (nitrate, nitrite, phosphate, silicate, and ammonia) in the water column;
2. Deploy for the first time during the AMT Program a nanomolar ammonia analysis system; and
3. Deploy a nanomolar chemiluminescence analysis system for detecting nitrate and nitrite.

The nanomolar analyzers will enhance the understanding of nutrient regimes and may provide nutrient signatures

and characteristics of the oceanic provinces that are encountered.

### 3.11.1 Methodology

The nutrient analyzer used during the AMT-5 cruise was a five-channel Technicon AAII, segmented flow autoanalyser. The chemical methodologies used were: nitrate (Brewer and Riley 1965), nitrite (Grasshoff 1976), phosphate (Kirkwood 1989), silicate (Kirkwood 1989), and ammonia (Mantoura and Woodward 1983). The nanomolar nitrate and nitrite detection methodology was from Garside (1982), and the nanomolar ammonia system was adapted from Jones (1991). Water samples were taken from the CTD system, and subsampled into clean Nalgene bottles (Appendix J). The analysis of the samples was completed within 3 h of sampling. Clean handling techniques were employed to avoid any contamination of the samples, particularly by ammonia. No samples were stored.

Underway continuous sampling of surface water used the nontoxic water system. The water was filtered in-line (Morris et al. 1978), before analysis of the macronutrients. For the underway nanomolar ammonia system, a discrepancy between the CTD samples and the underway analysis was detected, so the Millipore filter was removed and the water was only coarse filtered through a stainless steel mesh. The results for the CTD and underway samples from the same approximate depth of 7 m then agreed. Underway sampling was carried out where possible for the nanomolar ammonia system and where necessary. Where values reached microgram concentrations, the five-channel Technicon analyzer was deployed for the other nutrients.

All CTD samples were analyzed successfully with a negligible sample loss rate. As usual, the Technicon system showed its reliability and reproducibility in the harsh environment of marine research. The nanomolar nitrate/nitrite chemiluminescent system worked well, although, even this system was at the limits of its detection for many mixed layer samples from the oligotrophic stations south of the equator. The ammonia system performed well once a faulty peristaltic pump was replaced, giving unique measurements of ammonia concentration data from this part of the world ocean.

### 3.11.2 Preliminary Results

Nitrate was depleted from the surface mixed layer while still in the western approaches of the English Channel. At the 19°W,47°N station, surface nitrate was 23 nmol l$^{-1}$, with uniform concentrations throughout the mixed layer until the thermocline at 50 m, which also corresponded to the nutracline. At 250 m, the nitrate concentration was 10.9 $\mu$mol l$^{-1}$, phosphate was 0.56 and silicate was 4.41 $\mu$mol l$^{-1}$. The ammonia concentrations in the surface were at nanomolar concentrations from The Solent onwards. At the stations off the Bay of Biscay, the concentration was close to 30 nmol l$^{-1}$ throughout the water column down to 250 m, with no discernible concentration maximum.

Off West Africa at 20.52°W,10.55°N the thermocline was relatively shallow at 43 m, nitrate was 26 nmol l$^{-1}$ at the surface, decreasing to 8 nmol l$^{-1}$ at 30 m, and then increasing sharply at the thermocline. Ammonia was elevated close to the upwelling region and was about 70–80 nmol l$^{-1}$ in the surface waters. At 250 m, nitrate was 24 $\mu$mol l$^{-1}$, and silicate and phosphate was 10.6 $\mu$mol l$^{-1}$ and 1.7 $\mu$mol l$^{-1}$, respectively. At the station south of the equator (27.22°W,04.47°S), the thermocline had deepened to 83 m with surface nitrate at 18 nmol l$^{-1}$, dropping to 9 nmol l$^{-1}$ at samples down to the thermocline, where the nitrate increased sharply to 29 $\mu$mol l$^{-1}$ at 250 m.

In the South Atlantic gyre, the thermocline and nutracline were at a depth of 145 m, with severe nitrate depletion observed throughout the water column. Surface nitrate at 2 m was 21 nmol l$^{-1}$, but deeper, it was below the sensitivity limit of the NO$x$ Box, effectively 0–4 nmol l$^{-1}$ and just detectable at 125 m at 7 nmol l$^{-1}$. At 250 m, the lowest depth, nitrate was only 5.74 $\mu$mol l$^{-1}$. Ammonia concentration was only 35–40 nmol l$^{-1}$ in this region of severely nutrient depleted water. South of this station the thermocline was shallower and nitrate became detectable again. South of Montevideo, in a region of increased fluorescence, CTD 25 (51.55°W,38.50°S) had a surface nitrate concentration of 3.5 $\mu$mol l$^{-1}$. These high nitrate waters continued to the Falkland Islands, increasing in concentration onto the continental shelf north of the islands. The nitrite water column distribution generally showed a primary nitrite maximum at around the thermocline in the chlorophyll maximum region.

On a number of occasions, there was also an ammonia maximum in the water column, particularly in the more temperate northern waters, and this was found just shallower than the nitrite maximum. There was, however, no evidence of this maximum in the south Atlantic gyre. This feature was observed previously when nanomolar analysis systems were deployed. With the high resolution pigment data also available, it is hoped to get a better understanding of the mechanism for the formation of these maxima.

## 3.12 Nitrate and Ammonium Uptake

To determine the uptake rates for ammonium and nitrate, samples were taken through the water column with the CTD water bottle system for laboratory analysis (Appendix K). With the availability of the nanomolar analyzers for nitrate and ammonium ions, the natural isotope $^{15}$N can be added to the water samples at 10% of the ambient concentrations, to determine uptake rates. From these uptake rates, the $f$-ratio (defined as nitrate uptake divided by total nitrogen uptake) can be determined, which provides an estimate of carbon export. These rate determinations will be developed in combination with temperature and nitrate algorithms and used with satellite images of SST to derive maps of the $f$-ratio.

Nutrients analyses were carried out as described in the nutrients section. Samples for the uptake experiment were taken at nominally the 33% light penetration depth. A 2 l sample was taken for both nitrate and ammonium, plus two duplicate samples that were incubated in the dark. The natural isotope $^{15}N$ was added to the samples at 10% of the ambient concentrations. The samples were incubated through a light screen of 33%, in a water incubator filled with a flow from the nontoxic water supply. The incubations were carried out for 3 hours, ideally, over the maximum light irradiance period of the day, and no longer than 5 hours. After this time, the samples were filtered through an ashed GF/F filter, dried in an oven at 50°C and stored for analysis by low-level mass spectrometry techniques (Owens and Rees 1989).

New analytical low-level detection mass spectrometry protocols developed at PML will be used to analyze the returned samples. These techniques cannot be carried out at these ambient concentrations at any other laboratory worldwide, a facility unique to PML.

## 3.13 Biogasses

Nitrogen, a biologically essential element in the marine environment, is found in a variety of inorganic and organic forms in oxic seawater ranging from the thermodynamically most-stable species, nitrate, to reduced compounds such as ammonia and its methyl derivatives, the methylamines (MAs): monomethylamine (MMA), dimethylamine (DMA), and trimethylamine (TMA). These are biogenic compounds widely distributed in the marine environment and intimately involved in oceanic nitrogen fertility. In seawater, they partition between their dissolved gaseous form (e.g., $NH_3$ (s)), which may participate in air–sea gas exchange, and the solvated cationic form (e.g., $NH_4{}^+$(s)) which typically accounts for greater than 90% of their total dissolved concentrations.

Like other reduced biogenic gases (Fig. 20), e.g., methane and dimethylsulfide (DMS), $NH_3$ and the MAs are end-products of the microbial turnover of labile organic matter. For example, MAs may be produced by phytoplankton via the enzymatic breakdown (Hoffman elimination) of intracellular quaternary amine osmotica, such as, choline and glycine betaine (King 1988). This process is analogous to the production of DMS from its algal precursor dimethylsulphoniopropionate (DMSP). Although substantial data are available for primary productivity throughout the world ocean, little information exists linking phytoplankton community composition with climatically important biogas production on a global scale.

By virtue of their volatility, the dissolved gases $NH_3$ and MAs are capable of transfer across the air–sea interface (Van Neste et al. 1987, and Quinn 1988, and Quinn et al. 1988). Although only trace atmospheric constituents and poor absorbers of thermal radiation, $NH_3$ and MAs are proposed to play a key role in several aspects of tropospheric chemistry and climate modification. Recent field deployments of novel instrumentation (Gibb et al. 1995 and 1998) have, for the first time, allowed for characterizing the distribution of MAs in the marine and atmospheric environments and the demonstration of the importance of the marine atmosphere in their global redistribution.

The objectives of the biogases analyses were to:

1. Map the distribution of MAs and ammonium in representative surface samples and vertical profiles along the AMT transect;
2. Determine the MA concentrations in the gaseous, aerosol, and rainwater phases of the overlying atmosphere and, hence, calculate the direction and magnitude of their air–sea exchange fluxes;
3. Correlate MA concentrations and fluxes with pigment abundance and evaluate the potential of pigments as proxy markers of these biogases; and
4. Examine the relationship between MAs and DMS (the sulphur analog to MAs), in contrasting oceanic provinces and in the overlying atmospheric phases.

### 3.13.1 Methodology

Total dissolved ammonia and total MAs ($NH_4{}^+{}_{(aq)tot}$ and $MAs^+{}_{(aq)tot}$; Table 3) were determined simultaneously in seawater using the flow injection gas-diffusion coupled to ion chromatography (FIGD-IC) technique (Gibb et al. 1995). In the technique, the solvated cations $NH_4{}^+{}_{(aq)tot}$ and $MAs^+{}_{(aq)tot}$ are deprotonated to their gaseous forms ($NH_3$(aq) and MAs(aq)) through addition of alkali (NaOH) to a pH greater than 12, and selectively transferred via diffusion across a gas-permeable Gore-Tex®† membrane into a dynamic, acidic acceptor stream (40 mmol methane sulphonic acid) in which they are enriched in their cationic forms. The addition of ethylenediaminetetraacetic acid (EDTA) was used to chelate seawater alkali Earth metals. The enriched acceptor stream was transferred directly to a Dionex DX-100 ion chromatograph. Here, $NH_4{}^+$ and $MA^+$ cations were separated isocratically on 3×Dionex CG-10 columns within 15 min in a methane sulphonic acid eluent (40 mmol) and quantified by chemically suppressed conductimetric detection; *sec*-butylamine was used as an internal standard. A custom computer-interfaced control unit and data capture unit were used in series to direct the solenoid valve switching sequence of the flow-injection system, the ion chromatograph operation, and collection of data (Gibb et al. 1995).

Aerosol and gas phase atmospheric samples were collected in tandem using a cyclonic filter-pack air-sampling technique (Quinn et al. 1988 and 1990), adapted for use with an automated FIGD-IC system. Aerosols were collected on untreated polyfluorotetraethylene (PTFE) prefilters (47 mm in diameter with a 1 $\mu$m poresize—from Co-

† Gore-Tex is a registered trademark of W.L. Gore and Associates, Elkton, Maryland.

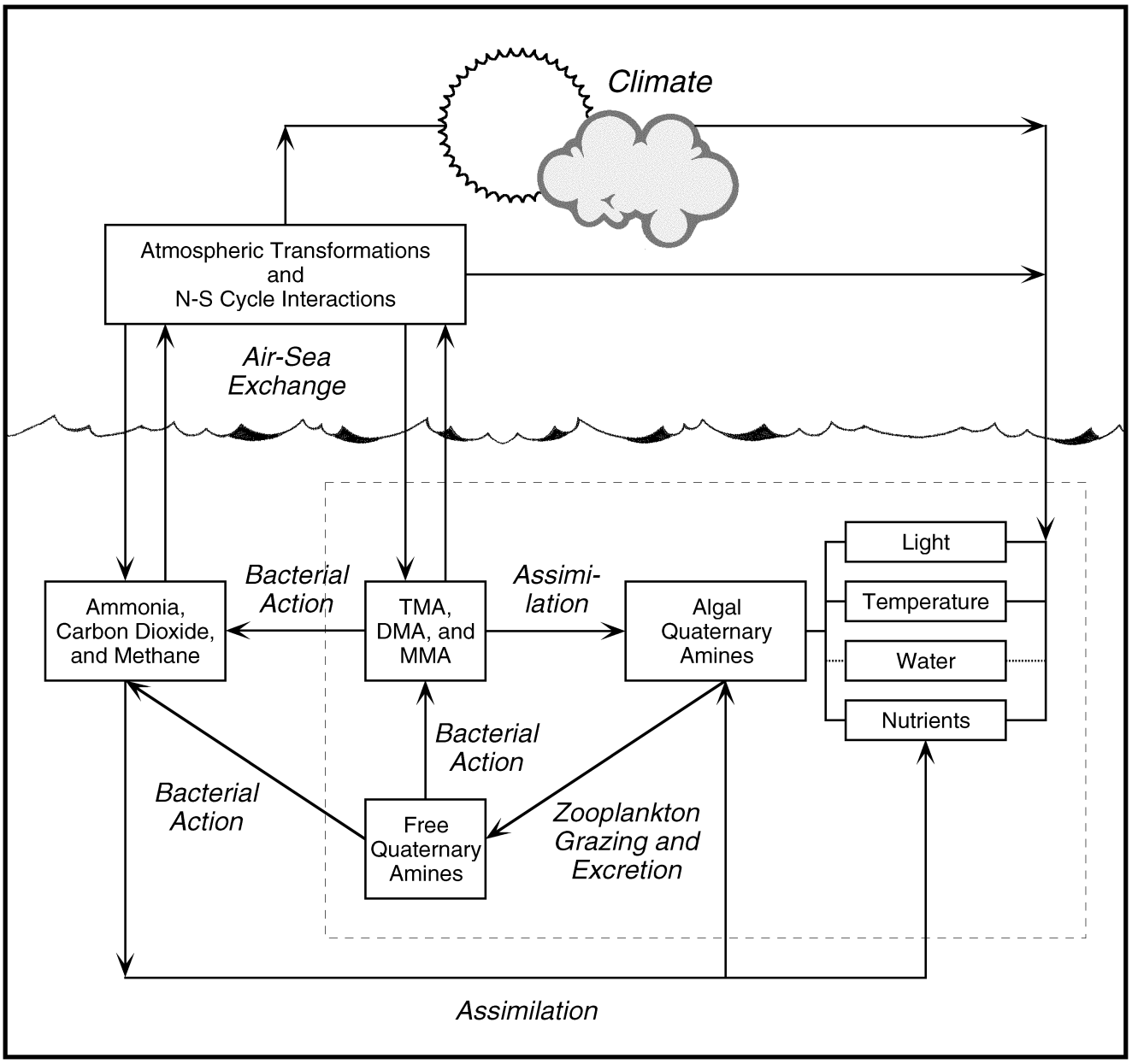


**Fig. 20.** A schematic showing selected aspects of the biogeochemical cycling of MAs in the marine environment.

star, UK), while gaseous species were collected downstream on pairs of oxalic acid-impregnated paper filters (47 mm diameter, Whatman 40, Whatman Scientific, UK). The cyclone separators have been shown to pass approximately 100% of particles less than 0.4 $\mu$m in diameter and 50% of those 0.9 $\mu$m in diameter, while Teflon particle filters had a reported collection efficiency of greater than 99% for particles with diameters greater than 0.035 $\mu$mol (Liu and Lee 1976). The combined system was thus effective in collecting accumulation mode aerosol, while rejecting coarse mode particles, because the intermode minimum of the bimodal distribution lies within the range of 0.5–1.0 $\mu$m (Quinn et al. 1990).

Rainwater samples were collected on an event-only basis using a series of polyethylene funnel-bottle combination collectors. Samples were analyzed unfiltered by FIGD-IC as for seawater samples. The data thus represents total deposition during the rain event.

## 3.14 Biogenic Sulphur Distribution

Biogenic DMS emissions from the world ocean are a significant source of sulfur to the atmosphere. The products of the atmospheric photochemical oxidation of DMS, most notably the sulfate aerosol, are believed to act as cloud condensation nucleii (CCN) which regulate the number of cloud droplets and, thus, the reflectivity (or albedo) of marine clouds. The resulting changes in global temperature caused by increased cloud cover closes a multistep feedback loop which directly links ocean biota with climate regulation (Charlson et al. 1987).

Significant DMS production is limited to a few classes of phytoplankton, primarily the *Dinophyceae* (dinoflagellates) and the *Prynmesiophyceae* (including the coccolithophores). Studies have shown other less predominant producers to be certain members of *Bacillariophyceae* (the diatoms) and *Chrysophyceae* (Keller et al. 1989). Biogenic DMS can be emitted directly from the cell or via the breakdown of DMSP, a compound thought to act as an osmolyte within phytoplankton cells (termed DMSPp). DMSP can also be directly released into seawater, most likely during zooplankton grazing or lysis, and is then called dissolved DMSP (DMSPd). The precise fate of DMSP in the water column is uncertain, but it is most likely that bacterial breakdown of DMSPd to DMS is most significant. Concentrations of DMSP in the world ocean have been sparsely studied, and the data set is even smaller than that existing for DMS.

The objectives of the biogenic sulphur distribution activity were to:

1. Determine the spatial distributions of DMS, DMSPp, and DMSPd in seawater surface transects and vertical profiles along the AMT-5 cruise track (Fig. 21);
2. Correlate DMS and DMSP distributions with those of chemotaxonomic phytoplankton pigments and, hence, to evaluate the potential of these pigments as proxy markers of DMS and DMSP;
3. Calculate air–sea exchange fluxes for DMS;
4. Examine the relationship between the distribution and fluxes of DMS and its nitrogenous analogs, the methylamines, in both the oceanic and atmospheric components of the environment; and
5. Characterize the chemical composition of marine aerosols and rainwater.

Seawater samples were taken from the nontoxic supply approximately every 2 h from 0800–2000 ship's time and daily from the CTD, typically from six depths. Samples were stored in a cool box and analyzed within 4 h of collection. Analysis for DMS was carried out on board by purging samples with nitrogen gas and cryogenically trapping in liquid nitrogen before injecting into a gas chromatograph (Varian 3300) with flame photometric detection.

Dissolved DMSPd is retained in the purged seawater, which is placed in 60 ml glass vials with 1 ml NaOH (10 M) and crimp sealed with gas-tight lids. Analysis for DMSPd will be carried out at a later date. Samples were first filtered through Millipore AP25 filters, to retain particulate DMSPp. The filters were placed in 20 ml glass vials containing 1 ml NaOH (10 M) and 19 ml purified water and then sealed with gas-tight crimp lids for subsequent laboratory analysis.

Aerosols were collected using a Graseby Anderson high volume sampler fitted with a cascade impactor. The flow rate was typically 0.8 $m^3\,min^{-1}$. Samples were normally collected over 24 h periods and only when the relative wind speed was greater than 3 $m\,s^{-1}$ and blowing from a 180° sector ahead of the ship. Filters were stored in reclosable plastic bags and frozen for subsequent laboratory analysis. Rainwater samples were collected on an event-only basis using a series of polyethylene funnel-bottle combination collectors.

## 3.15 Zooplankton

The objectives of the zooplankton research activity for AMT-5 were to examine spatial and temporal variation in zooplankton abundance, size and community structure, using the Optical Plankton Counter (OPC), carbon analysis, conventional taxonomic analysis, and to determine copepod feeding rates and its impact on phytoplankton primary production and chlorophyll stock.

At each daily station, three double WP-2 (200 and 100 $\mu$m mesh) vertical net casts were made. The first two casts were to 200 m and the third to 20 m. The first 200 m cast was used for gut evacuation experiments. From the second 200 m and 20 m casts, the 100 $\mu$m net sample was used for foramanifera analysis, and the 200 $\mu$m for OPC and biomass analysis. In addition, there were a number of night stations (three between 20–40°N, one close to the equator, and two in the South Atlantic). Night stations

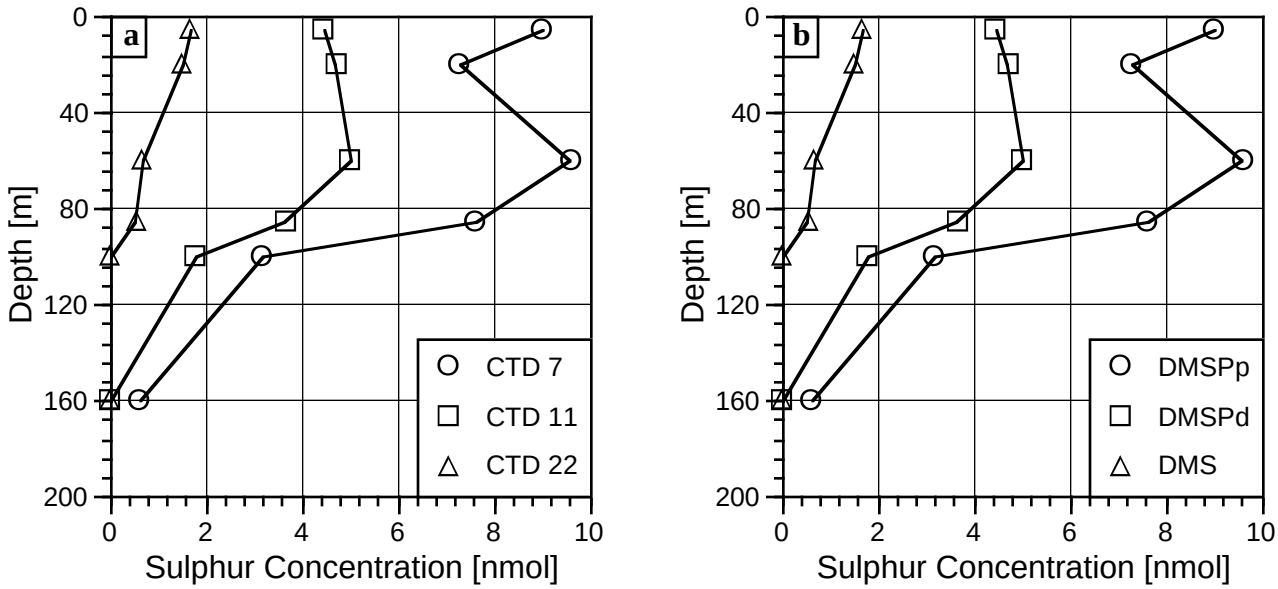


**Fig. 21.** DMS vertical profiles for **a)** CTD 7 (19.5233°W,35.4450°N), CTD 11 (20.5283°W,19.7200°N) in the Mauritanian upwelling, CTD 22 (40.9783°W,27.6900°S); and **b)** DMS, DMSPp, and DMSPd vertical profiles for CTD 7 (19.5233°W,35.4450°N).

consisted of a single cast of the double net (200 $\mu$m) to 200 m. One net sample was used for gut content analysis, and one for OPC and carbon analysis (the latter was split using a Folsom splitter).

### 3.15.1 Size-Fractionated Carbon

Half of the 200 m net (200 $\mu$m) sample was used for carbon analysis. The zooplankton were size fractionated by screening the sample through 2,000, 1,000, 500, and 200 $\mu$m sieves to create fractions of 200–500, 500–1,000, 1,000–2,000, and greater than 2,000 $\mu$m. The greater than 2,000 $\mu$m fraction was preserved. The other size fraction was made up to 500 or 1,000 ml depending on the density of zooplankton, and 50 ml aliquots of each size fraction were filtered onto pre-ashed Whatman GF/F filters (in triplicate). Filters were dried for 48 h in a 60°C oven and then compacted in aluminium foil for subsequent carbon-hydrogen-nitrogen (CHN) analysis at PML. The remainder of the sample was preserved with borax buffered formaldehyde (4%) for taxonomic identification.

### 3.15.2 OPC

Half of the 200 m net was passed through the OPC to give an estimate of the size structure. This sample was then collected and preserved in 4% formalin for subsequent taxonomic analysis. The 20 m net zooplankton sample was processed through the OPC in a similar manner and preserved.

The OPC was used in continuous flow-through mode during most of the cruise using the uncontaminated seawater supply. This was interrupted only briefly at local dusk and dawn to change data files, and for about 2 h each day on station to process the net samples. Its use was also prevented around Madeira, because of the ship's speed. In-line samples were collected from the OPC outflow using 200 $\mu$m mesh collection. This was preserved for subsequent analysis to validate the OPC data. A log of all zooplankton samples taken and samples for analysis are given in Appendix L.

### 3.15.3 Copepod Ingestion Rates

The gut fluorescence-evacuation method was used to obtain ingestion rates. At each station, one WP2 plankton net (200 $\mu$m) was deployed to 200 m. The sample was immediately screened to obtain three different size fractions (200–500, 500–1000, and more than 1,000 $\mu$m. Subsamples of each fraction were filtered and frozen for further determination of initial gut contents in each fraction. The remainder of one of the size fractions (one different fraction each day) was used for gut evacuation experiments. Copepods were kept in a cold box filled with filtered seawater from the station (7 m) and subsamples were taken every 5 min for half an hour. Extra subsamples, at 45 and 60 min, were taken if copepod abundance was enough. Subsamples were also filtered and frozen for further gut content analysis.

In some stations along the transect, particularly in the Azores area, night stations were used to compare night and day gut contents. A fixed number of herbivorous copepods were taken from the frozen filters to extract gut contents. The copepod number used was 25 for the large fraction, 50 for the medium, and 75 for the small. Between 1–3 replicates were taken each time. Chlorophyll was extracted us-

ing 5 ml of acetone (90%) in 20 ml vials for 24 hours at 4°C. Copepod gut fluorescence was determined using a Turner fluorometer before and after acidification, and expressed as chlorophyll *a* equivalents (in nanograms). Copepod gut content was plotted against time to obtain gut evacuation curves. Data were fitted to an exponential curve to calculate gut evacuation rate (slope of the curve).

### 3.15.4 Particulates

Samples for carbon–nitrogen analyses were obtained from two different depths: near surface (7 m) and the chlorophyll maximum, as determined by the fluorometer on the CTD. Water from the two depths was filtered through a membrane filter of 5 $\mu$m and a 200 $\mu$m gauze. The filtrate from each size fraction was filtered in triplicate onto pre-ashed Whatman GF/F filters to produce a series of replicate samples of the two size fractions (less than 5 $\mu$m and less than 200 $\mu$m). Filters were maintained for 48 h in an oven (60°C) and then compacted in pre-ashed aluminium foil for CHN analysis (Appendix M).

### 3.15.5 Preliminary Results

The total biovolume of zooplankton in the top 200 m, and the proportion represented by each size fraction changes markedly across the transect (Fig. 22a). In comparison to previous AMT transects at the same time of year, the AMT-5 pattern is slightly different (Fig. 22b). In the North, streamers of high productivity associated with upwelling, were crossed. The zooplankton in this area was higher than in previous years. The peak in biovolume at the southern end of the transect was smaller for the last two stations.

The underway data, shows marked diel changes. In general, the total biovolume is higher at night, and is characterized by an increase in the larger size fractions, e.g., days 274–276 (Fig. 22c).

## 3.16 Microzooplankton

Samples were taken to assess the latitudinal variability in composition and biomass of microzooplankton assemblages, and the potential relationship of these parameters with phytoplankton composition and environmental variables. The second objective was to carry out experiments to determine microzooplankton grazing activity at the DCM within the latitudinal range of the survey.

### 3.16.1 Methods

Microzooplankton samples were taken from Niskin bottles at every main daily CTD station (Appendix N). Four depths were sampled along the first part of the cruise until the beginning of CANIGO region, and six depths thereafter. The three sampling depths that were always chosen were: surface water, the DCM, and a sample beneath the DCM. The other sampling depths varied according to the available range of Niskin bottles between the surface and the DCM.

In order to obtain estimates of microzooplankton biomass, 500 ml water samples were fixed in 3% [final concentration (f.c.)] pre-added acid Lugol solution and stored dark in the cold room for subsequent analysis using the Uthermol sedimentation technique, an inverted microscope and a video-image analysis system.

Between 40–20°N, two replicates of 50 ml water samples were taken from six depths, as above, to assess the trophic status of the microzooplanktonic community. The samples were fixed in 1% (f.c.) glutaraldehyde, filtered through 0.8 $\mu$m black polycarbonate membrane filters, mounted onto slides and stored frozen (−80°C) for subsequent analysis under an epifluorescence microscope.

### 3.16.2 Grazing

Water incubations to determine microzooplankton grazing were carried out at alternate CTD stations following the standard dilution method (Landry 1993).

Water from the chlorophyll *a* maximum was taken from the CTD into an acid-washed polycarbonate carboy and combined with 0.2 $\mu$m filtered water to obtain four levels of natural water concentrations (20, 40, 70, and 100%). Filtered water was obtained by passing a sample through sequential 3.0, 0.6, and 0.2 $\mu$m Gelman filters. This process presumably removes all phytoplankton including prochlorophytes (Verity et al. 1996) and was always carried out immediately before use, to avoid the growth of bacteria in the filtered water. Filtered water (100 ml) from the 250 m depth Niskin bottle was added to each incubation bottle to avoid nutrient depletion and, then, growth limitation. One of the 100% level bottles was kept as a control, with no added nutrients.

Three replicate 2 l and 3 l polycarbonate bottles were slowly filled for each experimental concentration, thereby, avoiding bubbles. Silicon tubing was used for all the transfer procedures. Water was incubated on deck for 24 h, and cooled to ambient levels using underway flow, while a calibrated neutral mesh was used to simulate *in situ* light intensity.

At the beginning of the incubations, three replicates of 250 ml of natural water were filtered onto GF/F filters to assess the initial chlorophyll concentration. After incubation, chlorophyll *a* concentration was determined for each bottle (two replicates per bottle) using a Turner 10-005 R fluorometer. To control for changes in the abundance of grazers during the experiment, a 500 ml water sample from the 100% level bottle was taken at the end of the incubation period and fixed in 3% (f.c.) pre-added acid Lugol solution. The fluorometer used in the experiments and the one used for chlorophyll analysis were intercalibrated during the cruise.

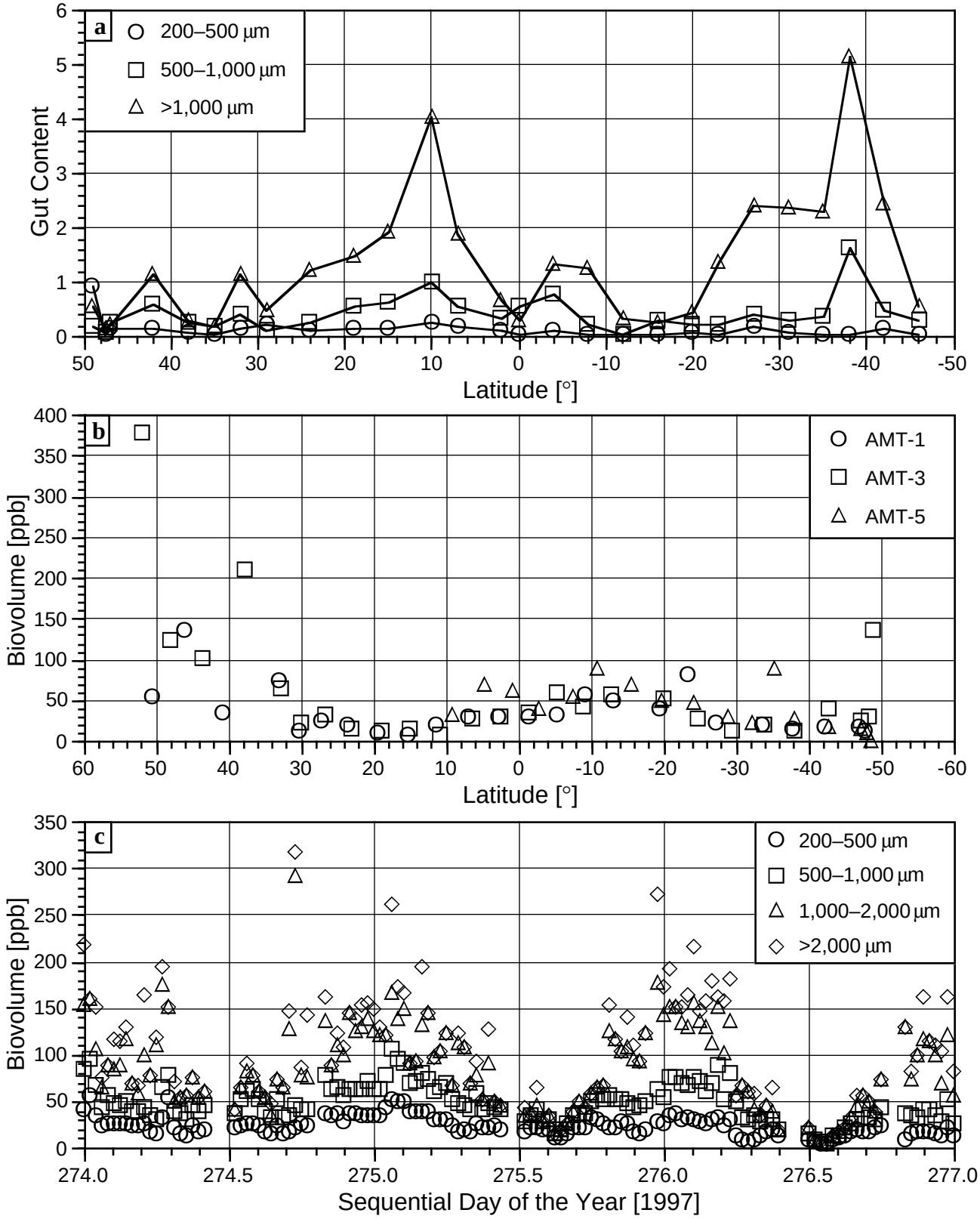


**Fig. 22.** Zooplankton biovolume anayses: **a)** size-fractionated biovolume along the transect (from 200 m vertical hauls); **b)** total biovolume of AMT-5 compared to AMT-1 and AMT-3; and **c)** size fractionated underway (30-minute bins).

## 3.17 DNA Analysis of Foraminifera

The planktonic foraminifera are a group of protists ubiquitous among the marine zooplankton. Their calcareous shells contribute approximately 70% to the oceanic carbonate sediment for the world ocean and are widely used for paleoenvironmental, stratigraphic, and evolutionary analyses. The planktonic foraminifera are the only extant group in which all species can be preserved as fossils in the geologic record.

The objectives of the deoxyribonucleic acid (DNA) analysis of foraminifera were:

1. An evolutionary study of the molecular clock to infer a general molecular phylogeny (with the ribosomal ribonucleic acid [rRNA] coding genes) of the planktonic foraminifera and to calibrate it with the fossil record, in order to calculate DNA evolutionary rates among the different lineages; and
2. A broad-scale study of the genetic variability in a planktonic group of organisms to a) characterize the latitudinal variability of DNA sequences at the species level in order to define the genetic boundaries between the populations in comparison with the physical oceanic characteristics, and b) to study the gene flows across the different water masses.

### 3.17.1 Methods

At each daily CTD station, between two and four net tows (100 and 200 $\mu$m mesh collected from a depth of 20 and 200 m) were made for the DNA analyses of the planktonic foraminifera. Samples were immediately distributed in petri dishes and examined with a dissecting microscope. The foraminifera were isolated and transferred to other receptacles containing filtered seawater. The samples were then sorted by species, based on their morphotypes when taxonomic identification was impossible with the optics available on board. In the latter case, some specimens were dried and stored on micropaleontological cells for further examination by scanning electronic microscopy (SEM).

DNA extractions were performed on the same day as collection, in order to avoid damage of the fragile specimens and artifacts due to degradation of cell material. The planktonic foraminifera were individually cleaned by brushing to eliminate the spines, detritus, and microorganisms at their surface. DNA extractions were performed by either 1) grinding individual or groups of specimens in 50 $\mu$l of an extraction buffer containing 100 mmol of trisamine (pH=8.5), 4 mmol of EDTA, 1% of sodium deoxycholate, 0.2% of Triton x-100, and incubated for 1 h at 60°C; or 2) by dissolving specimens in 40 $\mu$l of a guanidine-based buffer containing guanidium isothiocyanate, tris-HCl, EDTA, sodium lauryl sarkosinate, and $\beta$-mercaptoethanol. In addition, experimental tests to extract and conserve DNA from a single cell with preservation of its calcareous shell were carried out on 60 individuals. All DNA extracts were preserved at −20°C.

### 3.17.2 Accomplishments

A total of 631 DNA extractions on 30 specimens were achieved during AMT-5 and are presented in the log of Appendix O. Overall, 31 species belonging to 13 different genera (on 15 living) were determined and extracted. This represents two thirds of all living planktonic foraminiferal species. Representatives of all the families (*Globigerinidae, Hastigerinidae, Globorotalinidae* and *Candeinidae*) were found plus several species that have interesting evolutionary features, or unknown fossil origin. Most of the same species were found at several different stations in the transect, sometimes in different water masses (e.g., *Orbulina universa*, one of the most widely distributed species, was intensively studied at each station and will be used as a reference species for studying the plankton community genetic structure over basin scales.

Postcruise work in Geneva will consist of DNA amplification by polymerase chain reaction (PCR), cloning of the PCR products in supercompetent bacteria, and sequencing of the clones on a ABI 377 Prism automated sequencer. To start with, the gene coding for the ribosomal RNA will be targeted.

# 4. SeaWiFS

As stated in the goals of the AMT Program, the calibration and validation of satellite remotely-sensed ocean color data is an inherent objective, and the Program is a major contributor to the SeaWiFS validation effort (Hooker and McClain 1998). For AMT-5, which was designated SeaACE, this became the priority objective of the cruise, the objectives of which were as follows:

- Derive $E_d(\lambda)$, $L_u(\lambda)$, and $K_d(\lambda)$ from the SeaOPS and SeaFALLS casts at all SeaWiFS wavelengths, and report the values daily to the SeaWiFS Project; the optical data were quality assured at sea using the SQM, and the derived parameters were quality assured by statistical assessments, self-consistency checks on spectral shape, plus magnitude and empirical algorithm analyses.
- Report measured phytoplankton pigments (by at-sea HPLC and fluorometry), notably chlorophyll *a* and phaeopigments (where measured), 1 d in arrears to the SeaWiFS Project; these data were quality assured by intercomparison of the measurements by the two methods and by using an internal non-marine phytoplankton pigment as an internal standard (canthaxanthin).
- Compare measured and retrieved values (from measurements of water-leaving radiance, $L_W$, or $R_{rs}$, using a standard algorithm) of pigment concentration (chlorophyll *a* plus phaeopigments) and $K(490)$ as a quality assurance of the data and analyses techniques.

SeaOPS data were processed using the following procedures:

1. The SeaOPS and MVDS data, which by analogy with satellite data were designated raw level-0, were calibrated to engineering units (level-1a data) by the application of the relevant calibration files (after the detector dark values were subtracted).
2. The in-water and reference calibrated data sets were merged to form a combined data stream of $E_d(\lambda)$, $L_u(\lambda)$, and $E_s(\lambda)$ and auxiliary data (CTD, fluorescence, tilt, roll, etc.). The data were merged based on the time stamp data of the in-water and reference units (which should agree to within 0.1 s).
3. For quality assurance and data quality assessment, a subset of the level-1a data were plotted; scatter plots of $E_d(\lambda)$, $L_u(\lambda)$, and $E_s(\lambda)$ versus depth were produced as well as plots of profiles of temperature, fluorescence, and tilt and roll. All data were inspected for sensor reliability and screened for excessive tilt and roll values, cloud contamination, or any unfavorable experimental conditions (ship shadow, very low $E_s$ values, etc.).
4. From the plotted data, upper and lower depth limits of data acceptability were set, which encompassed temperature and chlorophyll *a* mixed layer depths, as well as, the $E_d(\lambda)$ and $L_u(\lambda)$ linearity range within at least (approximately) two optical depths.
5. The depth range to be used for extrapolating the in-water data to the surface were chosen by visual examination of plots of the remnant data for the surface layer at each station. The upper and lower depths for extrapolations were selected after a cautious examination of the $L_u$ profile, the $E_s$ stability, the profiler behavior (tilt and roll) and the CTD and fluorescence profiles. The radiometric data were regressed versus depth to produce $E_d(0^-)$, $K_d$, $L_u(0^-)$, $K_{L_u}$, $L_W$, $R_{rs}$ and $L_{WN}$.
6. At each station, the cast conducted under the best experimental conditions (i.e., best sea and sky conditions and ship orientation) was selected or, when all casts were considered good, an average value was computed.

For quality assessment, the following analyses were performed:

A. The diffuse attenuation coefficient, $K$, is a robust apparent optical property and, under most conditions, values of $K_d$ and $K_{L_u}$ should be very similar for the surface 1–2 optical depths. Significant difference between these two coefficients derived from simultaneous measurements, indicates a problem with either the measurement or the analysis of one or the other parameter. Individual data points can then be reanalyzed or rejected, if no assurance is forthcoming.

B. The comparison of the retrieved attenuation, from the measured $L_W(\lambda)$ data and a standard algorithm, and the measured attenuation from the *in situ* data, provides a validation of the $L_W$ data, given that the measured $K_d$ data have been prevalidated as in step 1. In this case, the SeaWiFS prelaunch algorithm for $K_d(490)$ (Mueller and Trees 1997), hereafter referred to as the MT97 algorithm, was used as the benchmark. In addition, this provided an assessment of the relative accuracy, as a fraction of the variance explained, of the algorithm considered.

C. The measured (*in situ*) chlorophyll concentration ($\tilde{C}$) versus the retrieved (remote sensing) chlorophyll concentration ($\hat{C}$) was computed using a standard algorithm. This is strictly not an assessment of the quality of any of the optical data, but rather an assessment of the accuracy of the *standard algorithm*. In this case, the SeaWiFS chlorophyll *a* operational algorithm (O'Reilly et al. 1998) has been used as the benchmark.

Figure 23a shows the plot of raw $K_{L_u}$ versus raw $K_d$ for all AMT-5 SeaOPS data. The figure shows a close agreement (slope equals 0.99), with a high percentage of the variance explained ($R^2 = 0.994$). Some outliers are evident, mostly at the low end, probably due to surface effects (light focusing by waves) influencing the downwelling data close to the surface. Interim versions of the regression, produced as the cruise progressed, identified some outliers, which on close examination were modified or deleted. In fact nearly all the data acquired passed this quality test and the only data omitted were those when the sky conditions were so variable that no good data could be retrieved reasonably.

Figure 23b shows the plot of the retrieved (modeled) and measured diffuse attenuation coefficients, $\hat{K}_d$ and $\tilde{K}_d$, respectively. The agreement between the two is generally good except for three stations at the high end which are underestimated by the model. Among these outliers, one is a station in the English Channel while the other two are stations in the vicinity of the Falkland Islands. Without these three (presumably Case 2) stations, the regression statistics are $\hat{K}_d(490) = 0.7903\tilde{K}_d(490) + 0.01$ with $R^2 = 0.8763$. It is important to note that the data processing scheme is optimized towards generating the $L_W$ with the highest possible accuracy. The selection of the depth range used for extrapolating the in-water data to the surface is a crucial step. The diffuse attenuation coefficients are computed from the same depth range which might not be the most appropriate for the derivation of $K_d$. When considering $K_{L_u}$ instead of $K_d$ in this analysis, the statistical results are slightly better.

For the third quality assessment test, if the assessment is *good* (i.e., the data fits the model with a large fraction of the variance explained and with close to a 1:1 relationship, then inherently the bio-optical data used with the retrieval

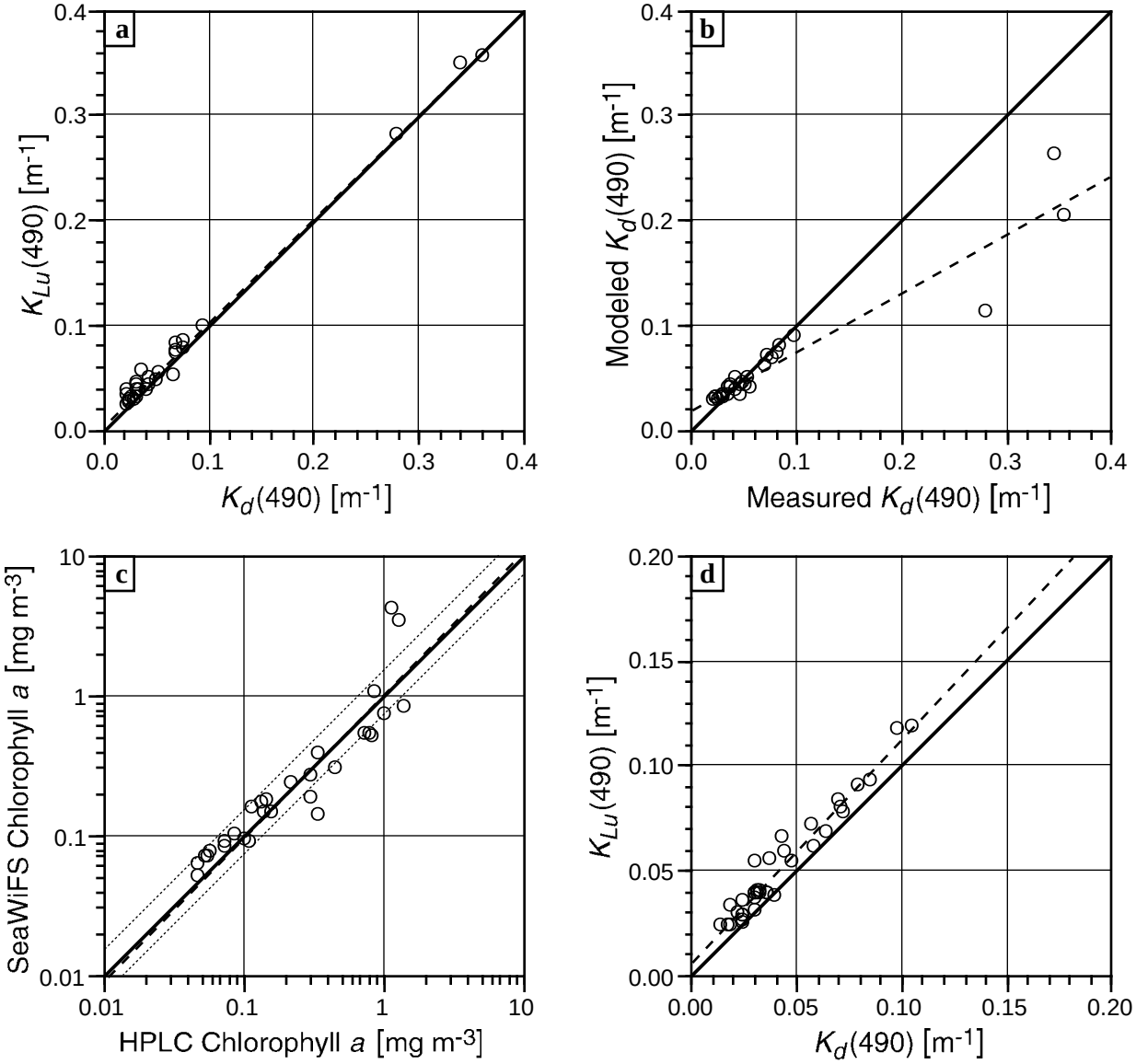


**Fig. 23.** Data quality assessment test results for SeaOPS and SeaFALLS data, **a**–**c** and **d**–**f**, respectively: **a)** raw $K_{L_u}$ versus raw $K_d$ data; **b)** modeled versus measured diffuse attenuation coefficients, $\hat{K}_d$ and $\tilde{K}_d$, respectively; **c)** *in situ* (HPLC) chlorophyll concentration versus the retrieved (remote sensing) chlorophyll concentration; and **d)** raw $K_{L_u}$ versus raw $K_d$ data.

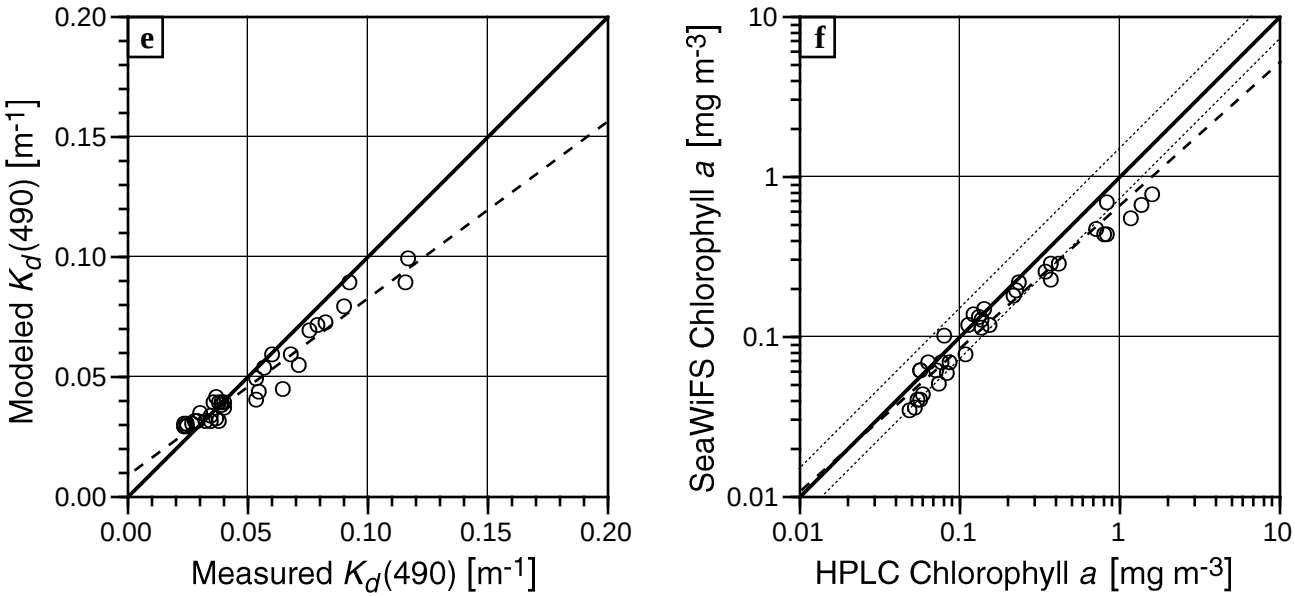


**Fig. 23. (cont.)** Data quality assessment test results for SeaFALLS data **e)** modeled versus measured diffuse attenuation coefficients, $\hat{K}_d$ and $\tilde{K}_d$, respectively; and **f)** *in situ* (HPLC) chlorophyll concentration versus the retrieved (remote sensing) chlorophyll concentration.

algorithm agree well with the data used to derive the algorithm, except for unlikely or anomalous circumstances. Figure 23c shows the results for the algorithm assessment (the dotted lines represent the ±35% boundaries of the 1:1 line).

SeaFALLS data are similar to SeaOPS data with two exceptions: a) there are 13 channels of $E_d$ data and 13 channels of $L_u$ data, and b) all of the $E_d$ and $L_u$ channels have auto gain switching to cover the wide dynamic range of the sensor response. In addition, the $L_u$ sensors are 0.9 m deeper than the $E_d$ sensors, and this must be taken into account when propogating the $L_u$ data to the surface to derive $L_W$. SeaFALLS data are processed by programs that adhere to the same protocols and procedures adopted for SeaOPS, but take into account the gain switching. The processed data are quality assured using the same analysis procedures established for SeaOPS. Figures 23d–23f show the three quality assessment products for SeaFALLS.

For chlorophyll, the modeled versus measured regressions (on log transformed data) have slopes close to unity and a large fraction of the variance explained ($R^2 = 0.86$ for SeaOPS and $R^2 = 0.95$ for SeaFALLS). Again, the statistics of SeaOPS are influenced by the three stations mentioned previously. For both radiometers, most stations fit within the ±35% limits. Both instruments differ slightly as chlorophyll *a* derived from SeaOPS data are relatively distributed around the 1:1 line while chlorophylls from SeaFALLS data tend to underestimate actual concentrations.

## Acknowledgments

The AMT Program combines a variety of research initiatives and receives resources and financial support from a number of diverse sources. The Centre for Coastal and Marine Studies (CCMS) funds the additional ship time added to the passage of the JCR. The PML Strategic Research Projects 1 and 4 provide scientific support, equipment, and resources. The NERC community research project PRIME funds two core AMT projects: Bio-optical Signatures and Zooplankton Characterization. The NASA SeaWiFS and MODIS Projects provide financial and logistical support, plus state-of-the-art optical, hydrographic, and calibration equipment. The EU CANIGO project participates and there are links with the EU Joint Research Centre at Ispra through various EU projects and NASA collaborations. The scientific objectives of the EU project SOMARE use the AMT project as a model. G. Zibordi is thanked for his help and advice during the preparation of the cruise and the analysis of the sun photometer data. S. Maritorena of the SeaWiFS Project provided optical data analysis results during the cruise, as well as a complete review and revision of the material presented in Section 4.

## Appendices

A. RRS *James Clark Ross*
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## Appendix A

RRS *James Clark Ross*

A detailed description of the scientific spaces, facilities, and equipment on board the RRS *James Clark Ross* can be found in Robins et al. (1996). The 27 officers and crew members of the RRS *James Clark Ross* during AMT-5 are listed in Table A1.

**Table A1.** The crew list for AMT-5.

| *Name* | | *Rank* |
|---|---|---|
| Elliott | Christopher | Master |
| Harper | John, R. | Chief Officer |
| Paterson | Robert, C. | Second Officer |
| Kilroy | Robin, T. | Third Officer |
| Waddicor | Charles, A. | Radio Officer |
| Cutting | David, J. | Chief Engineer |
| Kerswell | William, R. | Second Engineer |
| Jones | Roger, S. | Third Engineer |
| Eadie | Steven, J. | Fourth Engineer |
| Wright | Simon, A. | Deck Engineer |
| Thomas | Norman, E. | Electrician |
| Olley | Kenneth, R. | Catering Officer |
| Brookes | Martin | Bosun |
| Williams | James, H.W. | Bosun Mate |
| Graham | Roderick | Seaman First Class |
| Fairbrother | Carl, D. | Seaman First Class |
| Macko | Westley | Seaman First Class |
| Cossey | Peter, A. | Seaman First Class |
| Davis | Raymond, A. | Seaman First Class |
| Smith | Sydney, F. | Motorman |
| Robinshaw | Mark, A. | Motorman |
| Fox | Roy, W. | Chef |
| Bailey | David, R. | Second Chef |
| Clancey | John, A. | Second Steward |
| Dixon | Tony, N. | Steward |
| Baldwin-White | Lawrence, B. | Steward |
| Hadgraft | Simon, D. | Steward |

## Appendix B

*Scientific Bridge Log*

The Scientific Bridge Log is presented in Table B1.

## Appendix C

*CTD Station and Bottle Log*

Summaries of the CTD Station and Bottle Logs are presented in Tables C1 and C2, respectively.

## Appendix D

*XBT Cast Log*

A summary of the XBT casts is presented in Table D1.

## Appendix E

*Optics Deployment Log*

A summary of the SeaOPS, SeaFALLS, and LoCNESS Station Logs are presented in Tables E1, E2, and E3, respectively.

## Appendix F

*Sun Photometer Log*

A summary of the Sun Photometer Station Log is presented in Table F1.

## Appendix G

*XOTD Cast Log*

A summary of the XOTD Deployment Log is presented in Table G1.

## Appendix H

*FRRF Tow Log*

A summary of the FRRF Tow Log is presented in Table H1.

## Appendix I

*Underway and Station Filtration Logs*

A summary of the Underway and Station Filtration Logs are presented in Tables I1 and I2, respectively.

## Appendix J

*Nutrients Sample Log*

A summary of the Nutrients Sample Log is presented in Table J1.

## Appendix K

*Nitrate Sample Log*

A summary of the Nitrate Sample Log is presented in Table K1.

## Appendix L

*OPC Sample Log*

A summary of the OPC Sample Log is presented in Table L1.

## Appendix M

*CHN Sample Log*

A summary of the CHN Sample Log is presented in Table M1.

## Appendix N

*Microzooplankton Sample Log*

A summary of the Microzooplankton Sample Log is presented in Table N1.

## Appendix O

*DNA Analysis of Foraminifera Log*

Summaries of the DNA extractions in DOC buffer and guanidinium buffer are presented in Tables O1 and O2, respectively.

## Appendix P

*AMT-5 Cruise Participants*

A summary of the AMT-5 cruise participants is presented in Table P1.

**Table B1.** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 16 September | 259 | 1° 39.2′ W | 50° 25.8′ N | 02:00 PM | Stopped on Station 1. |
| | | | | 02:16 PM | SeaOPS deployed. |
| | | | | 02:19 PM | CTD deployed. |
| | | | | 02:31 PM | Plankton nets deployed. |
| | | | | 02:33 PM | CTD on surface. |
| | | | | 02:34 PM | SeaOPS on surface. |
| | | | | 02:34 PM | CTD recovered. |
| | | | | 02:35 PM | Plankton nets recovered. |
| | | | | 02:45 PM | XBT launched. |
| | | | | 02:50 PM | UOR deployed at 4 kts. |
| | | | | 02:58 PM | Resume cruising speed. |
| 17 September | 260 | 8 27.6 | 48 40.1 | 04:05 PM | Stopped on Station 2. |
| | | | | 04:10 PM | Plankton nets deployed. |
| | | | | 04:12 PM | CTD deployed. |
| | | | | 04:13 PM | SeaFALLS deployed. |
| | | | | 04:18 PM | Plankton nets recovered. |
| | | | | 04:22 PM | SeaFALLS recovered. |
| | | | | 04:32 PM | CTD recovered. |
| 18 September | 261 | 12 28.4 | 48 6.0 | 06:52 AM | XBT launched. |
| | | 13 12.3 | 47 59.0 | 10:00 AM | Stopped on Station 3. |
| | | | | 10:02 AM | SeaOPS deployed. |
| | | | | 10:05 AM | CTD and plankton nets deployed. |
| | | | | 10:34 AM | SeaOPS recovered. |
| | | | | 10:38 AM | CTD recovered. |
| | | | | 10:39 AM | Meteorology balloon launched. |
| | | | | 10:51 AM | Plankton nets recovered. |
| | | | | 10:55 AM | XBT launched. |
| | | | | 10:58 AM | Speed at 4 kts for UOR deployment. |
| | | | | 11:06 AM | UOR deployed on 250 m line. |
| 19 September | 262 | 17 58.7 | 47 15.6 | 08:00 AM | XBT launched. |
| | | 18 28.8 | 47 10.4 | 10:00 AM | Stopped on Station 4. |
| | | | | 10:09 AM | SeaOPS deployed. |
| | | | | 10:12 AM | CTD and plankton nets deployed. |
| | | | | 10:34 AM | SeaOPS recovered. |
| | | | | 10:39 AM | CTD recovered. |
| | | 18 28.5 | 47 10.2 | 10:39 AM | XBT launched. |
| | | | | 10:43 AM | Plankton nets recovered. |
| | | | | 11:10 AM | Speed 4 kts. |
| | | | | 11:25 AM | UOR deployed. |
| | | | | 11:25 AM | UOR recovered. |
| | | | | 11:37 AM | UOR redeployed. |
| | | | | 02:19 PM | UOR recovered. |
| | | 18 26.5 | 46 24.1 | 02:29 PM | SeaFALLS deployed. |
| | | | | 02:30 PM | Trimming SeaFALLS. |
| | | | | 03:00 PM | SeaFALLS recovered. |
| | | 18 58.6 | 46 26.2 | 04:40 PM | XBT launched. |
| | | 19 35.5 | 45 30.6 | 09:35 PM | XBT launched. |
| 20 September | 263 | 20 0.2 | 43 29.7 | 06:55 AM | XBT launched. |
| | | 19 57.0 | 42 50.6 | 10:00 AM | Stopped on Station 5. |
| | | | | 10:04 AM | CTD and plankton nets deployed. |
| | | | | 10:10 AM | SeaOPS deployed. |
| | | | | 10:30 AM | SeaOPS recovered. |
| | | | | 10:35 AM | CTD recovered; XBT launched. |
| | | | | 10:38 AM | Plankton nets recovered. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 20 September | 263 | | | 11:11 AM | Meteorology balloon launched. |
| | | | | 11:19 AM | CTD redeployed. |
| | | | | 11:38 AM | CTD recovered; speed increased to 4 kts. |
| | | | | 11:45 AM | UOR deployed; speed increased to 11 kts. |
| | | | | 02:13 PM | UOR recovered. |
| | | 19° 57.6′ W | 42° 26.0′ N | 02:27 PM | Stopped on Station 6. |
| | | | | 02:29 PM | SeaSURF deployed. |
| | | | | 02:33 PM | SeaFALLS deployed. |
| | | | | 02:50 PM | SeaFALLS recovered. |
| | | 20 0.3 | 41 57.3 | 05:35 PM | XBT deployed. |
| | | 20 0.3 | 41 4.9 | 10:12 PM | XBT launched. |
| 21 September | 264 | 20 0.1 | 39 21.0 | 06:50 AM | XBT launched. |
| | | 20 0.7 | 38 42.9 | 10:04 AM | Stopped on Station 7. |
| | | | | 10:06 AM | SeaOPS and CTD deployed. |
| | | | | 10:09 AM | Plankton nets deployed. |
| | | | | 10:36 AM | SeaOPS and CTD recovered. |
| | | | | 10:39 AM | Plankton nets recovered. |
| | | | | 10:48 AM | SeaSURF deployed. |
| | | | | 10:50 AM | SeaFALLS deployed. |
| | | | | 11:18 AM | SeaSURF recovered. |
| | | | | 11:20 AM | SeaFALLS recovered. |
| | | | | 11:42 AM | CTD redeployed. |
| | | | | 11:58 AM | CTD recovered. |
| | | | | 12:00 PM | Speed increased to 4 kts. |
| | | | | 12:18 PM | UOR deployed; speed 11 kts. |
| | | | | 02:12 PM | UOR recovered; XBT deployed. |
| | | 19 59.9 | 38 2.1 | 04:00 PM | XBT launched. |
| | | 19 58.4 | 37 40.3 | 05:50 PM | XBT launched. |
| | | 19 58.2 | 37 39.5 | 06:04 PM | XBT launched. |
| | | 19 54.5 | 37 20.2 | 07:45 PM | XBT launched. |
| | | 19 51.9 | 37 7.3 | 09:05 PM | Plankton nets deployed. |
| | | | | 09:22 PM | Plankton nets recovered. |
| | | 19 51.4 | 37 3.0 | 10:00 PM | XBT launched. |
| 22 September | 265 | 19 45.1 | 36 30.0 | 12:58 AM | XBT launched. |
| | | 19 31.8 | 35 26.9 | 07:08 AM | Stopped on Station 8. |
| | | | | 07:20 AM | Plankton nets deployed. |
| | | | | 07:44 AM | BAS CTD deployed. |
| | | | | 08:22 AM | CTD at 2,000 m. |
| | | 19 31.8 | 35 26.7 | 08:36 AM | CTD at 1,500 m. |
| | | | | 09:10 AM | CTD recovered. |
| | | | | 10:00 AM | Stopped on Station 9. |
| | | | | 10:06 AM | Sea-Bird CTD and SeaOPS deployed. |
| | | | | 10:32 AM | SeaOPS recovered. |
| | | | | 10:41 AM | Plankton nets recovered. |
| | | | | 10:45 AM | SeaSURF deployed. |
| | | | | 10:47 AM | SeaFALLS deployed. |
| | | | | 11:21 AM | SeaSURF recovered. |
| | | | | 11:22 AM | SeaFALLS recovered. |
| | | | | 11:27 AM | CTD at 85 m. |
| | | | | 11:35 AM | CTD recovered. |
| | | 19 29.7 | 35 25.0 | 11:55 AM | XBT launched. |
| | | | | 12:13 PM | Resume cruising speed. |
| | | 19 8.7 | 35 2.6 | 02:28 PM | Stopped on Station 10. |
| | | | | 02:29 PM | SeaSURF deployed. |
| | | | | 02:30 PM | SeaFALLS deployed. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| | | | | 02:46 PM | SeaSURF and SeaFALLS recovered. |
| 23 September | 266 | | | 10:48 AM | CTD deployed. |
| | | | | 10:58 AM | CTD recovered. |
| 25 September | 268 | 17° 14.4′ W | 32° 18.7′ N | 01:05 PM | Stopped on station T1. |
| | | | | 01:07 PM | CTD deployed for testing firing mechanism. |
| | | | | 01:40 PM | SeaSURF deployed. |
| | | | | 01:42 PM | SeaFALLS deployed. |
| | | | | 01:47 PM | CTD redeployed. |
| | | | | 02:15 PM | SeaSURF and SeaFALLS recovered. |
| | | | | 02:22 PM | CTD recovered. |
| | | | | 02:33 PM | Plankton nets recovered. |
| | | 18 33.0 | 31 12.7 | 09:42 PM | XBT launched. |
| 26 September | 269 | 20 32.1 | 29 24.8 | 08:34 AM | XBT deployed. |
| | | 20 58.4 | 29 3.1 | 11:00 AM | Stopped on Station 11. |
| | | | | 11:05 AM | CTD, SeaOPS, and plankton nets deployed. |
| | | | | 11:06 AM | SeaSURF deployed. |
| | | | | 11:10 AM | SeaFALLS deployed. |
| | | | | 11:42 AM | SeaOPS recovered. |
| | | 20 59.1 | 28 51.2 | 01:00 PM | XBT launched. |
| | | 20 59.1 | 28 38.0 | 02:05 PM | Stopped on Station 12. |
| | | | | 02:07 PM | SeaSURF deployed. |
| | | | | 02:08 PM | SeaFALLS deployed. |
| | | | | 02:35 PM | SeaSURF recovered. |
| | | | | 02:38 PM | SeaFALLS recovered. |
| | | 20 59.2 | 27 44.4 | 06:39 PM | XBT launched. |
| | | 21 0.0 | 26 46.3 | 11:00 PM | Plankton nets deployed. |
| | | 21 0.0 | 26 42.4 | 11:50 PM | XBT launched. |
| 27 September | 270 | 20 59.5 | 24 34.1 | 09:00 AM | XBT launched. |
| | | 20 59.9 | 24 8.1 | 11:00 AM | Stopped on Station 13. |
| | | | | 11:02 AM | CTD, SeaOPS, and plankton nets deployed. |
| | | | | 11:11 AM | SeaSURF and SeaFALLS deployed. |
| | | | | 11:48 AM | SeaOPS and CTD recovered. |
| | | | | 11:51 AM | SeaSURF and SeaFALLS recovered. |
| | | 21 0.5 | 23 51.8 | 01:17 PM | XBT launched. |
| | | 21 0.6 | 23 43.5 | 02:00 PM | Stopped on Station 14. |
| | | | | 02:05 PM | SeaSURF and SeaFALLS deployed. |
| | | | | 02:34 PM | SeaSURF and SeaFALLS recovered. |
| | | 20 59.9 | 22 50.5 | 06:50 PM | XBT launched. |
| | | 20 59.3 | 21 59.4 | 11:00 AM | Stopped on station. |
| | | | | 11:01 AM | Plankton nets deployed. |
| 28 September | 271 | 20 44.6 | 20 43.1 | 05:31 AM | XBT launched. |
| | | 20 40.7 | 20 25.4 | 07:10 AM | XBT launched. |
| | | 20 35.1 | 19 59.9 | 09:20 AM | XBT launched. |
| | | 20 30.0 | 19 43.1 | 11:00 AM | Stopped on Station 15. |
| | | | | 11:03 AM | CTD, SeaOPS, and plankton nets deployed. |
| | | | | 11:50 AM | CTD recovered. |
| | | | | 11:52 AM | SeaOPS recovered. |
| | | | | 12:04 PM | SeaFALLS recovered. |
| | | | | 12:12 PM | UOR deployed; XBT launched. |
| | | | | 12:22 PM | UOR on 250 m cable; cruising speed resumed. |
| | | | | 03:55 PM | Reducing speed for UOR recovery. |
| | | | | 04:05 PM | UOR recovered. |
| | | 20 25.1 | 19 3.0 | 04:08 PM | Stopped on Station 16. |
| | | | | 04:10 PM | SeaFALLS and SeaSURF deployed. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 28 September | 271 | | | 04:28 PM | SeaSURF recovered. |
| | | | | 04:29 PM | SeaFALLS recovered. |
| | | 20° 23.2′ W | 18° 52.1′ N | 05:27 PM | XBT launched. |
| | | 20 14.4 | 18 11.0 | 08:53 PM | XBT launched. |
| | | 20 8.5 | 17 47.9 | 11:00 PM | Stopped on station. |
| | | | | 11:02 PM | Plankton nets deployed. |
| | | | | 11:25 PM | Plankton nets recovered. |
| 29 September | 272 | 20 4.5 | 17 24.6 | 01:12 AM | XBT launched. |
| | | 20 0.0 | 17 1.5 | 03:19 AM | XBT launched. |
| | | 20 0.0 | 16 38.7 | 05:16 AM | XBT launched. |
| | | 20 0.0 | 16 15.4 | 07:13 AM | XBT launched. |
| | | 20 0.6 | 15 29.5 | 11:00 AM | Stopped on Station T2. |
| | | | | 11:01 AM | SeaOPS and plankton nets deployed. |
| | | | | 11:06 AM | SeaFALLS and SeaSURF deployed. |
| | | | | 11:30 AM | SeaSURF recovered. |
| | | | | 11:31 AM | SeaFALLS recovered. |
| | | | | 11:32 AM | SeaOPS recovered. |
| | | 20 0.9 | 15 13.6 | 12:54 PM | XBT launched |
| | | 19 59.7 | 14 0.3 | 06:54 PM | XBT launched. |
| 30 September | 273 | 20 52.2 | 10 55.3 | 11:00 AM | Stopped on Station 17. |
| | | | | 11:02 AM | Plankton nets deployed. |
| | | | | 11:04 AM | CTD and SeaOPS deployed. |
| | | | | 11:10 AM | SeaFALLS and SeaSURF deployed. |
| | | | | 11:35 AM | SeaOPS recovered. |
| | | | | 11:44 AM | SeaFALLS and SeaSURF recovered. |
| | | | | 11:45 AM | Plankton nets recovered. |
| | | | | 11:55 AM | UOR deployed. |
| | | | | 03:55 PM | Reducing speed for UOR recovery. |
| | | | | 04:04 PM | UOR recovered. |
| | | 21 11.8 | 10 13.2 | 04:06 PM | Stopped on Station 18. |
| | | | | 04:16 PM | Off station seeking clear sky. |
| | | 21 10.6 | 10 12.7 | 04:30 PM | On station. |
| | | | | 04:33 PM | SeaFALLS and SeaSURF deployed. |
| | | | | 04:53 PM | SeaFALLS and SeaSURF recovered. |
| 1 October | 274 | 21 51.8 | 8 27.0 | 03:00 AM | XBT launched. |
| | | 22 1.6 | 8 3.1 | 05:08 AM | XBT launched. |
| | | 22 10.8 | 7 40.4 | 07:10 AM | XBT launched. |
| | | 22 16.8 | 7 24.1 | 08:44 AM | XBT launched. |
| | | 22 28.2 | 7 1.6 | 11:00 AM | Stopped on Station 19. |
| | | | | 11:02 AM | Plankton nets deployed. |
| | | | | 11:04 AM | SeaOPS and CTD deployed. |
| | | | | 11:06 AM | SeaFALLS and SeaSURF deployed. |
| | | | | 11:47 AM | SeaOPS recovered. |
| | | | | 11:48 AM | CTD recovered. |
| | | | | 11:50 AM | Plankton nets recovered. |
| | | | | 11:53 AM | XBT launched. |
| | | 22 37.2 | 6 34.8 | 02:19 PM | XBT launched. |
| | | 22 44.2 | 6 17.0 | 04:06 PM | UOR recovered. |
| | | 22 44.9 | 6 15.0 | 04:15 PM | XBT launched. |
| | | 22 53.7 | 5 54.1 | 06:15 PM | XBT launched. |
| | | 23 4.1 | 5 29.3 | 08:33 PM | XBT launched. |
| | | 23 19.8 | 4 52.2 | 11:55 PM | XBT launched. |
| 2 October | 275 | 23 29.5 | 4 28.8 | 02:00 AM | XBT launched. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 2 October | 275 | 23° 39.1′ W | 4° 05.0′ N | 04:04 AM | XBT launched. |
| | | 23 47.6 | 3 43.4 | 06:00 AM | XBT launched. |
| | | 23 56.6 | 3 21.4 | 08:00 AM | XBT launched. |
| | | 24 7.3 | 2 55.4 | 10:05 AM | XBT launched. |
| | | 24 9.8 | 2 49.0 | 10:59 AM | Stopped on Station 20. |
| | | | | 11:06 AM | CTD SeaOPS and plankton nets deployed. |
| | | | | 11:45 AM | CTD and SeaOPS recovered. |
| | | | | 12:00 PM | SeaOPS redeployed. |
| | | | | 12:10 PM | SeaOPS recovered. |
| | | | | 12:15 PM | UOR deployed. |
| | | 24 13.9 | 2 38.0 | 01:15 PM | XBT launched. |
| | | | | 04:27 PM | Reduce speed for UOR recovery. |
| | | | | 04:35 PM | UOR recovered. |
| | | 24 27.8 | 2 4.6 | 04:40 PM | Stopped on Station 21. |
| | | | | 04:49 PM | SeaOPS and SeaSURF deployed. |
| | | | | 04:52 PM | SeaFALLS deployed. |
| | | | | 05:30 PM | SeaOPS recovered. |
| | | | | 05:45 PM | SeaSURF recovered. |
| | | | | 05:47 PM | SeaFALLS recovered. |
| | | 24 27.0 | 2 3.1 | 05:55 PM | XBT launched. |
| | | 24 30.0 | 1 56.0 | 06:40 PM | XBT launched. |
| | | 24 47.2 | 1 21.1 | 10:00 PM | XBT launched. |
| | | 24 51.2 | 1 11.2 | 11:00 PM | Plankton nets deployed. |
| | | | | 11:24 PM | Plankton nets recovered. |
| | | 24 51.3 | 1 11.0 | 11:30 PM | XBT launched. |
| 3 October | 276 | 24 58.0 | 0 54.4 | 12:48 AM | XBT launched. |
| | | 25 7.5 | 0 29.6 | 03:15 AM | XBT launched. |
| | | 25 17.0 | 0 7.4 | 05:20 AM | XBT launched. |
| | | 25° 26.0′ W | 0° 13.0′ S | 07:20 AM | XBT launched. |
| | | 25 39.9 | 0 46.4 | 10:30 AM | Stopped on Station 22. |
| | | | | 10:31 AM | Plankton nets deployed. |
| | | | | 10:40 AM | CTD and SeaOPS deployed. |
| | | | | 11:30 AM | CTD recovered. |
| | | | | 11:50 AM | SeaFALLS and SeaSURF recovered. |
| | | | | 12:10 PM | SeaOPS recovered. |
| | | | | 12:15 PM | SeaFALLS and SeaSURF deployed. |
| | | | | 12:30 PM | SeaFALLS and SeaSURF recovered. |
| | | 25 41.7 | 0 50.2 | 01:03 PM | XBT launched. |
| | | 25 53.8 | 1 21.5 | 04:10 PM | Stopped on Station 23. |
| | | | | 04:13 PM | SeaSURF deployed. |
| | | | | 04:15 PM | SeaFALLS deployed. |
| | | | | 04:46 PM | SeaSURF recovered. |
| | | | | 04:50 PM | SeaFALLS recovered. |
| | | 26 4.8 | 1 48.5 | 07:58 PM | XBT launched. |
| 4 October | 277 | 26 26.6 | 2 37.3 | 12:20 AM | XBT launched. |
| | | | | 09:20 AM | XBT launched. |
| | | 27 22.0 | 4 47.1 | 11:30 AM | Stopped on Station 24. |
| | | | | 11:40 AM | CTD and SeaOPS deployed. |
| | | | | 11:41 AM | SeaSURF deployed. |
| | | | | 11:45 AM | SeaFALLS deployed. |
| | | | | 12:30 PM | CTD recovered. |
| | | | | 12:33 PM | Plankton nets recovered. |
| | | | | 01:06 PM | SeaOPS recovered. |
| | | | | 01:12 PM | SeaSURF recovered. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 4 October | 277 | | | 01:14 PM | SeaFALLS recovered. |
| | | 27° 35.9′ W | 5° 18.5′ S | 04:05 PM | Stopped on Station 25. |
| | | | | 04:07 PM | SeaFALLS and SeaSURF deployed. |
| | | | | 04:39 PM | SeaSURF recovered. |
| | | | | 04:42 PM | SeaFALLS recovered. |
| | | 27 37.5 | 5 22.3 | 05:00 PM | XBT deployed. |
| 5 October | 278 | 29 0.4 | 8 41.5 | 09:57 AM | XBT launched. |
| | | 29 6.9 | 8 58.0 | 11:30 AM | Stopped on Station 26. |
| | | | | 11:32 AM | Plankton nets deployed. |
| | | | | 11:38 AM | CTD and SeaOPS deployed. |
| | | | | 12:19 PM | SeaOPS recovered. |
| | | | | 12:22 PM | CTD recovered. |
| | | | | 12:35 PM | Nets, SeaFALLS, SeaSURF, and SeaBOSS deployed. |
| | | | | 01:10 PM | Plankton nets recovered. |
| | | | | 01:12 PM | SeaOPS recovered. |
| | | | | 01:18 PM | UOR deployed. |
| | | | | 05:07 PM | UOR recovered. |
| | | 29 22.9 | 9 36.8 | 05:10 PM | Stopped on Station 27. |
| | | | | 05:12 PM | SeaBOSS deployed. |
| | | | | 05:15 PM | SeaSURF deployed. |
| | | | | 05:16 PM | SeaFALLS deployed. |
| | | | | 05:35 PM | SeaSURF recovered. |
| | | | | 05:37 PM | SeaBOSS recovered. |
| | | | | 05:38 PM | SeaFALLS recovered. |
| | | 29 23.6 | 9 38.3 | 05:50 PM | XBT launched. |
| | | 29 39.6 | 10 14.7 | 09:03 PM | XBT launched. |
| 6 October | 279 | 30 42.3 | 11 8.2 | 01:50 AM | XBT launched. |
| | | 30 42.3 | 12 52.6 | 11:31 AM | Stopped on Station 28. |
| | | | | 11:32 AM | Plankton nets deployed. |
| | | | | 11:35 AM | SeaOPS and CTD deployed. |
| | | | | 11:45 AM | SeaFALLS, SeaSURF, and SeaBOSS deployed. |
| | | | | 12:06 PM | Plankton nets recovered. |
| | | | | 12:12 PM | CTD recovered. |
| | | | | 01:17 PM | Plankton nets and SeaOPS recovered. |
| | | | | 01:20 PM | SeaSURF recovered. |
| | | | | 01:26 PM | SeaFALLS and SeaBOSS recovered. |
| | | | | 01:29 PM | UOR deployed. |
| | | | | 04:29 PM | UOR recovered. |
| | | 30 57.1 | 13 28.5 | 05:12 PM | XBT launched. |
| | | 31 10.4 | 13 57.0 | 08:04 PM | XBT launched. |
| | | 31 25.6 | 14 28.6 | 11:12 PM | XBT launched. |
| 7 October | 280 | 31 39.3 | 15 1.4 | 02:10 AM | XBT launched. |
| | | 31 46.6 | 15 17.8 | 03:35 AM | XBT launched. |
| | | 32 11.5 | 16 16.0 | 09:02 AM | XBT launched. |
| | | 32 21.8 | 16 41.0 | 11:30 AM | Stopped on Station 29. |
| | | | | 11:31 AM | Plankton nets deployed. |
| | | | | 11:32 AM | CTD, SeaOPS, SeaFALLS, and SeaSURF deployed. |
| | | | | 11:37 AM | SeaBOSS deployed. |
| | | | | 12:10 PM | SeaOPS recovered. |
| | | | | 12:24 PM | CTD and plankton nets recovered. |
| | | | | 12:26 PM | XBT launched. UOR deployed. |
| | | | | 03:07 PM | UOR recovered. |
| | | 32 32.8 | 17 8.8 | 03:12 PM | Stopped on Station 30. |
| | | | | 03:13 PM | SeaOPS deployed. |
| | | | | 03:17 PM | SeaBOSS and SeaSURF deployed. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 7 October | 280 | | | 03:20 PM | SeaFALLS deployed. |
| | | | | 03:53 PM | SeaOPS recovered. |
| | | | | 04:02 PM | References recovered. |
| | | | | 04:04 PM | SeaBOSS and SeaSURF recovered. |
| | | 32° 48.0′ W | 17° 49.4′ S | 07:56 PM | XBT launched. |
| | | 33 10.7 | 18 40.1 | 01:30 AM | XBT launched. |
| 8 October | 281 | 34 3.0 | 20 24.0 | 09:52 AM | XBT launched. |
| | | 34 13.5 | 20 39.7 | 11:42 AM | Stopped on Station 31. |
| | | | | 11:43 AM | SeaOPS and plankton nets deployed. |
| | | | | 11:45 AM | CTD deployed. |
| | | | | 12:30 PM | CTD recovered. |
| | | | | 01:31 PM | SeaOPS and plankton nets recovered. |
| | | | | 01:40 PM | SeaSURF recovered. |
| | | | | 02:01 PM | UOR deployed. |
| | | | | 04:35 PM | UOR recovered. |
| | | 34 33.4 | 21 4.9 | 04:44 PM | Stopped on Station 32. |
| | | | | 04:45 PM | SeaSURF deployed. |
| | | | | 04:46 PM | SeaFALLS deployed. |
| | | | | 05:04 PM | SeaSURF recovered. |
| | | | | 05:05 PM | SeaFALLS recovered. |
| | | 35 18.5 | 21 52.9 | 10:10 PM | XBT launched. |
| 9 October | 282 | 36 53.2 | 23 29.6 | 08:56 AM | XBT launched. |
| | | 37 17.1 | 23 54.2 | 11:40 AM | Stopped on Station 33. |
| | | | | 11:43 AM | CTD plankton nets and SeaOPS deployed. |
| | | | | 12:06 PM | SeaOPS recovered. |
| | | | | 12:21 PM | CTD recovered. |
| | | | | 12:23 PM | Plankton nets recovered. |
| | | 38 21.2 | 24 59.9 | 07:07 PM | XBT launched. |
| 10 October | 283 | 39 6.5 | 25 48.8 | 12:01 AM | Plankton nets deployed. |
| | | | | 12:25 AM | Plankton nets recovered. |
| | | 40 24.1 | 27 4.2 | 07:57 AM | XBT launched. |
| | | 40 58.6 | 27 41.4 | 11:30 AM | Stopped on Station 34. |
| | | | | 11:32 AM | Plankton nets deployed. |
| | | | | 11:36 AM | CTD and SeaOPS deployed. |
| | | | | 12:06 PM | SeaOPS recovered. |
| | | | | 12:14 PM | CTD recovered. |
| | | | | 12:15 PM | Plankton nets recovered. |
| | | 41 20.3 | 28 2.1 | 02:22 PM | XBT launched. |
| 11 October | 284 | 42 55.9 | 29 40.3 | 12:01 AM | Plankton nets deployed. |
| | | | | 12:14 AM | Plankton nets recovered. |
| | | 43 12.2 | 29 55.0 | | XBT launched. |
| | | 44 24.3 | 31 10.6 | 09:15 AM | XBT launched. |
| | | 44 52.0 | 31 37.2 | 12:00 PM | Stopped on Station 35. |
| | | | | 12:02 PM | Plankton nets deployed. |
| | | | | 12:12 PM | CTD and SeaOPS deployed. |
| | | | | 12:16 PM | LoCNESS deployed. |
| | | | | 12:26 PM | CTD wire off sheave; repair commenced. |
| | | | | 02:40 PM | SeaOPS recovered. |
| | | | | 01:30 PM | Recovery of CTD resumed. |
| | | | | 01:36 PM | Plankton nets recovered. |
| | | | | 01:43 PM | CTD recovered; no water available. |
| | | 44 54.3 | 31 38.1 | 01:55 PM | XBT launched. |
| | | 45 52.9 | 32 38.4 | 07:30 PM | XBT launched. |
| 12 October | 285 | 46 59.4 | 33 43.1 | 02:00 AM | XBT launched. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 12 October | 285 | 48° 43.9′ W | 35° 21.3′ S | 11:43 AM | XBT launched. |
| | | 48 51.8 | 35 29.5 | 12:40 PM | Stopped on Station 36. |
| | | | | 12:41 PM | Plankton nets deployed. |
| | | | | 12:42 PM | CTD deployed. |
| | | | | 12:44 PM | SeaOPS deployed. |
| | | | | 12:51 PM | SeaOPS recovered; SeaFALLS and LoCNESS deployed. |
| | | | | 12:57 PM | Plankton nets deployed. |
| | | | | 01:30 PM | CTD recovered. |
| | | 49 4.1 | 35 43.4 | 03:37 PM | XBT launched. |
| | | 49 27.0 | 36 5.4 | 06:03 PM | Stopped on Station 37. |
| | | | | 06:05 PM | LoCNESS and SeaFALLS deployed. |
| | | | | 06:18 PM | LoCNESS redeployed after trimming. |
| | | | | 06:43 PM | XBT launched. |
| | | 50 5.7 | 36 42.3 | 10:52 PM | XBT launched. |
| 13 October | 286 | 50 26.7 | 37 2.5 | 01:00 AM | Stopped on station. |
| | | | | 01:02 AM | Plankton nets deployed. |
| | | | | 01:25 AM | Plankton nets recovered. |
| | | 50 27.8 | 37 3.6 | 01:39 AM | XBT launched. |
| | | 50 47.9 | 37 26.4 | 03:46 AM | XBT launched. |
| | | 51 25.5 | 38 13.7 | 08:09 AM | XBT launched. |
| | | 51 47.1 | 38 40.3 | 10:50 AM | XBT launched. |
| | | 51 54.4 | 38 49.9 | 12:00 PM | Stopped on Station 38. |
| | | | | 12:13 PM | Plankton nets deployed. |
| | | | | 12:15 PM | SeaOPS and CTD deployed. |
| | | | | 12:37 PM | SeaOPS recovered. |
| | | | | 12:50 PM | CTD and plankton nets recovered. |
| | | | | 12:58 PM | Plankton nets, SeaFALLS, and LoCNESS deployed. |
| | | | | 01:45 PM | All recovered. |
| | | | | 01:50 PM | UOR deployed. |
| | | | | 04:08 PM | UOR recovered. |
| | | 52 8.8 | 39 11.9 | 04:13 PM | Stopped on Station 39. |
| | | | | 04:21 PM | LoCNESS deployed. |
| | | | | 04:34 PM | LoCNESS redeployed after trimming. |
| | | | | 04:40 PM | SeaFALLS deployed. |
| | | | | 05:21 PM | SeaOPS recovered. |
| | | 52 6.3 | 39 12.3 | 05:28 PM | XBT launched. |
| | | 52 15.6 | 39 27.0 | 07:11 PM | XBT launched. |
| | | 52 28.3 | 39 44.1 | 08:59 PM | XBT launched. |
| | | 52 43.2 | 40 6.5 | 11:15 PM | XBT launched. |
| 14 October | 287 | 52 58.4 | 40 23.6 | 01:00 AM | Plankton nets deployed. |
| | | | | 01:16 AM | Plankton nets recovered. |
| | | 52 59.3 | 40 25.6 | 01:30 AM | XBT launched. |
| | | 53 12.7 | 40 41.5 | 03:12 AM | XBT launched. |
| | | 53 25.4 | 40 58.9 | 05:00 AM | XBT launched. |
| | | 53 45.3 | 41 22.3 | 07:28 AM | XBT launched. |
| | | 53 58.1 | 41 39.4 | 09:08 AM | XBT launched. |
| | | 54 14.9 | 42 1.0 | 11:08 AM | XBT launched. |
| | | 54 27.6 | 42 14.3 | 12:36 PM | Stopped on Station 40. |
| | | | | 12:44 PM | Plankton nets, CTD, and SeaOPS deployed. |
| | | | | 01:33 PM | CTD recovered. |
| | | | | 01:39 PM | SeaOPS recovered. |
| | | | | 01:44 PM | LoCNESS and SeaFALLS recovered. |
| | | | | 01:54 PM | UOR deployed. |
| | | 54 31.9 | 42 16.2 | 02:00 PM | XBT launched. |

**Table B1. (cont.)** A summary of the Scientific Bridge Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *Time* | *Activity* |
|---|---|---|---|---|---|
| 14 October | 287 | | | 04:43 PM | UOR recovered. |
| | | 54° 52.0′ W | 42° 47.8′ S | 04:59 PM | Stopped on station. |
| | | | | 05:03 PM | SeaOPS and CTD deployed. |
| | | | | 05:45 PM | CTD recovered. |
| | | | | 05:56 PM | LoCNESS deployed. |
| | | | | 06:12 PM | All recovered. |
| | | 54 58.4 | 42 56.8 | 06:56 PM | XBT launched. |
| | | 55 6.7 | 43 10.2 | 08:00 PM | XBT launched. |
| | | 55 27.0 | 43 37.9 | 10:00 PM | XBT launched. |
| 15 October | 288 | 55 41.0 | 43 55.0 | 12:01 AM | XBT launched. |
| | | 55 41.9 | 43 56.8 | 12:05 AM | XBT launched, second attempt. |
| | | 55 49.6 | 44 4.6 | 01:00 AM | Plankton nets deployed. |
| | | | | 01:14 AM | Plankton nets recovered. |
| | | 55 57.5 | 44 15.9 | 02:16 AM | XBT launched. |
| | | 56 13.5 | 44 35.5 | 04:03 AM | XBT launched. |
| | | 56 31.5 | 44 55.5 | 06:05 AM | XBT launched. |
| | | 56 37.0 | 45 18.0 | 08:02 AM | XBT launched. |
| | | 56 40.1 | 45 41.8 | 10:06 AM | XBT launched. |
| | | 56 42.1 | 46 2.6 | 12:00 PM | Stopped on Station 42. |
| | | | | 12:02 PM | Plankton nets deployed. |
| | | | | 12:13 PM | CTD deployed. |
| | | | | 12:20 PM | LoCNESS and SeaFALLS deployed. |
| | | | | 12:55 PM | CTD recovered. |
| | | | | 01:00 PM | SeaOPS deployed. |
| | | | | 01:24 PM | SeaOPS and plankton nets recovered. |
| | | | | 01:37 PM | SeaOPS deployed. |
| | | | | 02:20 PM | SeaOPS recovered. |
| | | | | 02:36 PM | UOR deployed. |
| | | | | 05:00 PM | UOR recovered. |
| | | 56 45.2 | 46 32.4 | 05:09 PM | Stopped on Station 43. |
| | | | | 05:12 PM | CTD deployed. |
| | | | | 05:25 PM | LoCNESS and SeaFALLS deployed. |
| | | | | 05:38 PM | LoCNESS and SeaFALLS recovered. |
| | | | | 05:40 PM | CTD recovered. |
| | | 56 53.9 | 47 42.4 | 11:42 PM | XBT launched. |
| 16 October | 289 | 56 57.9 | 48 7.2 | 12:49 AM | XBT launched. |
| | | 57 37.6 | 49 47.6 | 12:32 PM | Stopped on Station 44. |
| | | | | 12:33 PM | Plankton nets and SeaOPS deployed. |
| | | | | 12:40 PM | CTD deployed. |
| | | | | 12:45 PM | LoCNESS and SeaFALLS deployed. |
| | | | | 01:00 PM | CTD recovered. |
| | | | | 01:20 PM | SeaOPS recovered. |
| | | | | 01:26 PM | LoCNESS and SeaFALLS recovered. |
| | | | | 01:30 PM | Plankton nets recovered. |
| | | | | 01:44 PM | UOR deployed. |
| | | | | 03:49 PM | UOR recovered. |
| | | 58 14.1 | 49 47.8 | 03:55 PM | Stopped on Station 45. |
| | | | | 04:08 PM | SeaOPS deployed. |
| | | | | 04:15 PM | CTD deployed. |
| | | | | 04:17 PM | LoCNESS and SeaFALLS deployed. |
| | | | | 04:42 PM | CTD recovered. |
| | | | | 05:15 PM | SeaOPS recovered. |
| 17 October | 290 | 57 42.2 | 51 39.9 | 11:20 AM | Stopped on Station 46. |
| | | | | 11:25 AM | SeaOPS deployed. |
| | | | | 12:00 PM | SeaOPS recovered. |

**Table C1.** A summary of the CTD Station Log for AMT-5. All times are in GMT.

| *Cast* | *Date* | *SDY* | *Time* | *Longitude* | *Latitude* | *Comment* |
|---|---|---|---|---|---|---|
| 1 | 16 September | 259 | 1422 | 1° 39.1′ W | 50° 27.6′ N | All bottles leaked badly. |
| 2 | 17 | 260 | 1611 | 8 27.4 | 48 40.2 | Bottles 2 and 5 did not fire. |
| 3 | 18 | 261 | 1008 | 13 12.3 | 47 59.0 | Bottle 5 did not fire. |
| 4 | 19 | 262 | 1013 | 18 28.9 | 47 10.4 | Bottles 2, 3, 5, and 6 did not fire. |
| 5 | 20 | 263 | 1009 | 19 57.8 | 42 50.5 | Bottles 2, 3, 5, and 6 did not fire. |
| 5a | 20 | 263 | 1116 | 19 57.8 | 42 50.5 | Bottles 2, 5, and 6 did not fire. |
| 6 | 21 September | 264 | 1010 | 20 0.7 | 38 43.0 | Bottles 2, 5, 6, and 9 did not fire. |
| 6a | 21 | 264 | 1144 | 20 0.7 | 38 43.0 | Bottle 9 did not close. |
| 7d | 22 | 265 | 0744 | 19 31.9 | 35 26.9 | BAS CTD no bottle data available. |
| 7 | 22 | 265 | 0907 | 19 31.4 | 35 26.7 | Bottle 6 did not fire. |
| 7a | 22 | 265 | 1028 | 19 31.4 | 35 26.7 | Bottles 2, 3, 5, and 6 did not fire. |
| 8 | 25 | 268 | 1344 | 17 13.6 | 32 18.6 | Bottles 2 and 5 did not fire. |
| 9 | 26 September | 269 | 1103 | 20 58.1 | 29 2.8 | Bottles 2 and 5 did not fire. |
| 10 | 27 | 270 | 1106 | 20 59.9 | 24 8.1 | Bottles 2 and 6 did not fire. |
| 11 | 28 | 271 | 1102 | 20 31.7 | 19 43.2 | All bottles fired. |
| 12 | 30 | 273 | 1104 | 20 52.2 | 10 55.3 | All bottles fired. |
| 13 | 1 October | 274 | 1102 | 22 28.3 | 7 1.6 | All bottles fired. |
| 14 | 2 | 275 | 1105 | 24 9.8 | 2 49.0 | All bottles fired. |
| 15 | 3 October | 276 | 1039 | 25° 39.8′ W | 0° 46.5′ S | Bottle 2 failed to close at the bottom. |
| 16 | 4 | 277 | 1140 | 27 22.1 | 2 47.2 | All bottles fired. |
| 17 | 5 | 278 | 1136 | 29 6.9 | 8 58.0 | All bottles fired. |
| 18 | 6 | 279 | 1135 | 30 42.3 | 12 52.6 | All bottles fired. |
| 19 | 7 | 280 | 1136 | 32 42.3 | 16 52.6 | All bottles fired. |
| 20 | 8 | 281 | 1145 | 34 13.5 | 20 39.7 | All bottles fired. |
| 21 | 9 October | 282 | 1144 | 37 17.2 | 23 54.1 | All bottles fired. |
| 22 | 10 | 283 | 1135 | 40 58.6 | 27 41.4 | All bottles fired. |
| 23 | 11 | 284 | 1210 | 44 52.1 | 31 37.2 | Cast aborted due to wire failure. |
| 24 | 12 | 285 | 1242 | 48 51.6 | 35 28.6 | All bottles fired. |
| 25 | 13 | 286 | 1215 | 51 55.1 | 38 50.1 | All bottles fired. |
| 26 | 14 | 287 | 1240 | 54 27.3 | 42 14.3 | All bottles fired. |
| 27 | 14 October | 287 | 1701 | 54 52.6 | 42 49.3 | All bottles fired. |
| 28 | 15 | 288 | 1214 | 56 41.9 | 46 2.7 | All bottles fired. |
| 29 | 15 | 288 | 1713 | 56 45.2 | 46 32.4 | All bottles fired. |
| 30 | 16 | 289 | 1243 | 57 39.6 | 49 47.7 | All bottles fired. |
| 31 | 16 | 289 | 1615 | 58 14.1 | 49 47.8 | All bottles fired. |

**Table C2.** A summary of the CTD Bottle Log for AMT-5. The temperature from CTD sensors 1 and 2 ($T_1$ and $T_2$, respectively) are in units of degrees Celcius, the salinity from CTD sensors 1 and 2 ($S_1$ and $S_2$, respectively) are in PSU, the transmittance ($T_r$) is in percent light transmitted, and the fluorescence, PAR, and deck cell PAR ($F$, PAR, and $\mathrm{PAR}_S$, respectively) are all in volts.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 24.7 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.208 | 0.00 | 1.07 |
| | 2 | 24.5 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.211 | 0.00 | 1.07 |
| | 3 | 24.7 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.195 | 0.00 | 1.08 |
| | 4 | 24.5 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.218 | 0.00 | 1.08 |
| | 5 | 24.6 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.214 | 0.00 | 1.08 |
| | 6 | 24.6 | 17.7 | 35.223 | 17.7 | 35.222 | 0.78 | 0.217 | 0.00 | 1.08 |
| | 7 | 14.7 | 17.7 | 35.223 | 17.7 | 35.222 | 0.79 | 0.217 | 0.45 | 1.17 |
| | 8 | 14.6 | 17.7 | 35.223 | 17.7 | 35.222 | 0.79 | 0.223 | 0.47 | 1.18 |
| | 9 | 14.6 | 17.7 | 35.223 | 17.7 | 35.222 | 0.79 | 0.213 | 0.51 | 1.24 |
| | 10 | 9.3 | 17.7 | 35.223 | 17.7 | 35.222 | 0.79 | 0.229 | 1.37 | 1.28 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | 4.6 | 17.7 | 35.223 | 17.7 | 35.221 | 0.79 | 0.240 | 2.13 | 1.28 |
| | 12 | 1.6 | 17.7 | 35.223 | 17.7 | 35.222 | 0.80 | 0.218 | 2.62 | 1.24 |
| 2 | 1 | 114.7 | 12.2 | 35.598 | 12.2 | 35.597 | 0.95 | 0.088 | 0.00 | 0.91 |
| | 2 | 100.2 | 12.2 | 35.598 | 12.2 | 35.596 | 0.96 | 0.090 | 0.00 | 1.05 |
| | 3 | 98.2 | 12.2 | 35.598 | 12.2 | 35.596 | 0.95 | 0.089 | 0.00 | 0.66 |
| | 4 | 80.7 | 12.2 | 35.598 | 12.2 | 35.596 | 0.96 | 0.090 | 0.00 | 1.03 |
| | 5 | 59.7 | 12.2 | 35.599 | 12.2 | 35.597 | 0.96 | 0.091 | 0.15 | 0.46 |
| | 6 | 46.1 | 12.6 | 35.598 | 12.6 | 35.594 | 0.97 | 0.113 | 0.48 | 0.59 |
| | 7 | 35.7 | 14.4 | 35.578 | 14.4 | 35.572 | 0.97 | 0.200 | 0.79 | 0.39 |
| | 8 | 35.1 | 14.4 | 35.579 | 14.4 | 35.576 | 0.96 | 0.210 | 0.80 | 0.39 |
| | 9 | 24.8 | 16.1 | 35.558 | 16.1 | 35.548 | 0.96 | 0.245 | 1.23 | 0.43 |
| | 10 | 15.2 | 16.7 | 35.567 | 16.7 | 35.565 | 0.96 | 0.178 | 1.56 | 0.40 |
| | 11 | 9.1 | 16.7 | 35.566 | 16.7 | 35.564 | 0.97 | 0.161 | 1.74 | 0.40 |
| | 12 | 5.3 | 16.8 | 35.547 | 16.9 | 35.545 | 0.97 | 0.114 | 1.90 | 0.41 |
| 3 | 1 | 252.0 | 11.4 | 35.565 | 11.4 | 35.564 | 0.98 | 0.066 | 0.00 | 1.23 |
| | 2 | 161.3 | 12.0 | 35.632 | 12.0 | 35.632 | 0.98 | 0.066 | 0.00 | 1.22 |
| | 3 | 101.9 | 12.5 | 35.695 | 12.5 | 35.693 | 0.98 | 0.067 | 0.00 | 1.06 |
| | 4 | 81.7 | 12.7 | 35.714 | 12.7 | 35.712 | 0.98 | 0.081 | 0.00 | 0.77 |
| | 5 | 80.3 | 12.7 | 35.714 | 12.7 | 35.712 | 0.98 | 0.081 | 0.00 | 0.78 |
| | 6 | 61.8 | 12.8 | 35.723 | 12.9 | 35.721 | 0.98 | 0.119 | 0.22 | 1.27 |
| | 7 | 41.8 | 13.6 | 35.713 | 13.7 | 35.708 | 0.96 | 0.271 | 0.73 | 1.26 |
| | 8 | 42.8 | 13.7 | 35.716 | 13.7 | 35.712 | 0.96 | 0.266 | 0.78 | 1.34 |
| | 9 | 32.2 | 16.5 | 35.640 | 16.4 | 35.627 | 0.95 | 0.262 | 1.00 | 1.07 |
| | 10 | 17.1 | 17.5 | 35.634 | 17.5 | 35.632 | 0.96 | 0.131 | 1.24 | 0.48 |
| | 11 | 12.2 | 17.5 | 35.635 | 17.5 | 35.633 | 0.96 | 0.130 | 1.53 | 0.53 |
| | 12 | 7.1 | 17.5 | 35.635 | 17.5 | 35.633 | 0.96 | 0.108 | 1.86 | 0.88 |
| 4 | 1 | 248.4 | 12.0 | 35.621 | 12.0 | 35.620 | 0.98 | 0.067 | 0.00 | 1.69 |
| | 2 | 161.4 | 12.5 | 35.691 | 12.5 | 35.690 | 0.98 | 0.069 | 0.00 | 0.61 |
| | 3 | 101.2 | 12.8 | 35.723 | 12.8 | 35.721 | 0.98 | 0.087 | 0.00 | 0.57 |
| | 4 | 83.0 | 13.0 | 35.734 | 13.0 | 35.731 | 0.98 | 0.107 | 0.00 | 0.49 |
| | 5 | 82.0 | 13.0 | 35.737 | 13.0 | 35.735 | 0.98 | 0.109 | 0.00 | 0.48 |
| | 6 | 67.6 | 13.3 | 35.745 | 13.3 | 35.738 | 0.97 | 0.133 | 0.00 | 0.40 |
| | 7 | 52.8 | 14.7 | 35.760 | 14.6 | 35.759 | 0.96 | 0.300 | 0.25 | 0.29 |
| | 8 | 53.8 | 14.6 | 35.764 | 14.6 | 35.761 | 0.96 | 0.294 | 0.21 | 0.28 |
| | 9 | 40.6 | 17.6 | 35.760 | 17.4 | 35.756 | 0.96 | 0.165 | 0.72 | 0.31 |
| | 10 | 22.7 | 17.8 | 35.763 | 17.8 | 35.761 | 0.96 | 0.131 | 1.29 | 0.41 |
| | 11 | 12.9 | 17.8 | 35.763 | 17.8 | 35.761 | 0.96 | 0.131 | 1.53 | 0.38 |
| | 12 | 6.5 | 17.8 | 35.763 | 17.8 | 35.761 | 0.96 | 0.131 | 1.73 | 0.33 |
| 5 | 1 | 251.3 | 12.7 | 35.719 | 12.7 | 35.717 | 0.96 | 0.067 | 0.00 | 0.97 |
| | 2 | 161.8 | 13.4 | 35.811 | 13.4 | 35.809 | 0.96 | 0.069 | 0.00 | 0.81 |
| | 3 | 99.7 | 14.1 | 35.913 | 14.1 | 35.911 | 0.96 | 0.082 | 0.00 | 0.87 |
| | 4 | 78.6 | 14.3 | 35.943 | 14.3 | 35.941 | 0.96 | 0.112 | 0.25 | 0.81 |
| | 5 | 60.3 | 14.5 | 35.953 | 14.5 | 35.951 | 0.95 | 0.153 | 0.67 | 0.82 |
| | 6 | 51.4 | 14.7 | 35.947 | 14.7 | 35.945 | 0.95 | 0.254 | 0.92 | 0.80 |
| | 7 | 40.6 | 16.0 | 35.913 | 16.0 | 35.910 | 0.94 | 0.297 | 1.29 | 0.81 |
| | 8 | 40.1 | 16.0 | 35.910 | 16.1 | 35.909 | 0.94 | 0.309 | 1.32 | 0.81 |
| | 9 | 30.9 | 19.1 | 35.864 | 19.1 | 35.863 | 0.95 | 0.089 | 1.57 | 0.82 |
| | 10 | 21.1 | 19.1 | 35.871 | 19.1 | 35.868 | 0.95 | 0.088 | 1.81 | 0.86 |
| | 11 | 11.2 | 19.1 | 35.871 | 19.1 | 35.869 | 0.95 | 0.082 | 2.08 | 0.88 |
| | 12 | 5.9 | 19.1 | 35.871 | 19.1 | 35.869 | 0.95 | 0.079 | 2.27 | 0.92 |
| 5a | 1 | 160.6 | 13.4 | 35.816 | 13.4 | 35.813 | 0.96 | 0.067 | 0.00 | 0.75 |
| | 2 | 160.6 | 13.4 | 35.817 | 13.4 | 35.814 | 0.96 | 0.067 | 0.00 | 0.75 |
| | 3 | 160.6 | 13.4 | 35.816 | 13.4 | 35.814 | 0.96 | 0.067 | 0.00 | 0.75 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 5a | 4 | 100.4 | 14.0 | 35.907 | 14.0 | 35.905 | 0.96 | 0.078 | 0.00 | 0.76 |
| | 5 | 100.3 | 14.0 | 35.909 | 14.0 | 35.907 | 0.96 | 0.079 | 0.00 | 0.76 |
| | 6 | 100.0 | 14.0 | 35.912 | 14.1 | 35.911 | 0.96 | 0.080 | 0.00 | 0.76 |
| | 7 | 60.2 | 14.6 | 35.943 | 14.6 | 35.941 | 0.95 | 0.221 | 0.70 | 0.75 |
| | 8 | 60.3 | 14.6 | 35.945 | 14.6 | 35.942 | 0.95 | 0.230 | 0.70 | 0.75 |
| | 9 | 60.1 | 14.6 | 35.945 | 14.6 | 35.943 | 0.95 | 0.235 | 0.71 | 0.76 |
| | 10 | 50.6 | 15.0 | 35.949 | 15.0 | 35.947 | 0.94 | 0.284 | 1.00 | 0.76 |
| | 11 | 50.8 | 15.3 | 35.943 | 15.3 | 35.939 | 0.94 | 0.302 | 1.01 | 0.76 |
| | 12 | 50.6 | 15.3 | 35.943 | 15.3 | 35.942 | 0.94 | 0.296 | 1.02 | 0.77 |
| 6 | 1 | 252.8 | 12.9 | 35.763 | 12.9 | 35.760 | 0.96 | 0.063 | 0.00 | 1.40 |
| | 2 | 162.4 | 13.7 | 35.884 | 13.7 | 35.882 | 0.96 | 0.066 | 0.00 | 1.41 |
| | 3 | 122.4 | 14.3 | 35.948 | 14.3 | 35.945 | 0.96 | 0.087 | 0.00 | 1.47 |
| | 4 | 102.1 | 14.6 | 35.987 | 14.7 | 35.985 | 0.96 | 0.104 | 0.26 | 1.36 |
| | 5 | 92.0 | 14.8 | 36.001 | 14.8 | 35.992 | 0.96 | 0.121 | 0.05 | 0.39 |
| | 6 | 81.4 | 15.3 | 36.037 | 15.3 | 36.034 | 0.95 | 0.193 | 0.77 | 1.41 |
| | 7 | 81.5 | 15.3 | 36.037 | 15.3 | 36.034 | 0.95 | 0.192 | 0.77 | 1.41 |
| | 8 | 66.9 | 16.4 | 36.047 | 16.4 | 36.040 | 0.95 | 0.136 | 1.19 | 1.40 |
| | 9 | 41.9 | 18.4 | 36.041 | 18.4 | 36.038 | 0.95 | 0.084 | 1.74 | 1.30 |
| | 10 | 22.2 | 22.0 | 36.228 | 22.0 | 36.222 | 0.95 | 0.072 | 2.18 | 1.43 |
| | 11 | 12.3 | 22.1 | 36.242 | 22.1 | 36.239 | 0.95 | 0.070 | 2.37 | 1.43 |
| | 12 | 7.3 | 22.1 | 36.242 | 22.1 | 36.239 | 0.95 | 0.068 | 2.50 | 1.45 |
| 6a | 1 | 163.0 | 13.8 | 35.896 | 13.8 | 35.894 | 0.96 | 0.068 | 0.00 | 1.84 |
| | 2 | 162.7 | 13.8 | 35.898 | 13.8 | 35.894 | 0.96 | 0.068 | 0.00 | 1.81 |
| | 3 | 163.5 | 13.8 | 35.897 | 13.8 | 35.894 | 0.96 | 0.067 | 0.00 | 1.62 |
| | 4 | 92.7 | 15.0 | 36.019 | 15.1 | 36.022 | 0.95 | 0.149 | 0.63 | 1.32 |
| | 5 | 92.5 | 15.1 | 36.036 | 15.1 | 36.034 | 0.95 | 0.166 | 0.55 | 1.12 |
| | 6 | 92.8 | 15.1 | 36.037 | 15.1 | 36.033 | 0.95 | 0.157 | 0.51 | 1.22 |
| | 7 | 82.7 | 15.6 | 36.047 | 15.6 | 36.043 | 0.95 | 0.208 | 0.82 | 1.12 |
| | 8 | 82.8 | 15.6 | 36.049 | 15.6 | 36.046 | 0.95 | 0.210 | 0.76 | 1.05 |
| | 9 | 82.7 | 15.6 | 36.052 | 15.6 | 36.049 | 0.95 | 0.212 | 0.69 | 0.94 |
| | 10 | 42.7 | 19.2 | 36.065 | 19.2 | 36.063 | 0.95 | 0.079 | 1.67 | 1.07 |
| | 11 | 42.8 | 19.1 | 36.066 | 19.1 | 36.063 | 0.95 | 0.080 | 1.59 | 0.95 |
| | 12 | 42.7 | 19.1 | 36.066 | 19.1 | 36.063 | 0.95 | 0.080 | 1.57 | 0.94 |
| 7 | 1 | 250.4 | 13.6 | 35.887 | 13.6 | 35.883 | 0.96 | 0.064 | 0.00 | 0.45 |
| | 2 | 161.4 | 14.7 | 36.040 | 14.7 | 36.037 | 0.96 | 0.069 | 0.00 | 0.52 |
| | 3 | 121.7 | 15.2 | 36.077 | 15.2 | 36.076 | 0.96 | 0.090 | 0.00 | 0.75 |
| | 4 | 101.6 | 15.7 | 36.120 | 15.7 | 36.112 | 0.95 | 0.118 | 0.00 | 0.76 |
| | 5 | 86.4 | 16.3 | 36.127 | 16.3 | 36.124 | 0.95 | 0.205 | 0.41 | 0.78 |
| | 6 | 86.3 | 16.3 | 36.126 | 16.3 | 36.123 | 0.94 | 0.209 | 0.42 | 0.79 |
| | 7 | 75.9 | 17.0 | 36.181 | 17.0 | 36.179 | 0.95 | 0.105 | 0.73 | 0.83 |
| | 8 | 60.8 | 18.0 | 36.197 | 18.1 | 36.194 | 0.95 | 0.089 | 1.12 | 0.85 |
| | 9 | 40.5 | 20.8 | 36.270 | 20.9 | 36.274 | 0.95 | 0.073 | 1.61 | 0.80 |
| | 10 | 21.1 | 23.3 | 36.506 | 23.3 | 36.496 | 0.95 | 0.067 | 1.88 | 0.79 |
| | 11 | 11.0 | 23.5 | 36.477 | 23.5 | 36.464 | 0.95 | 0.066 | 2.21 | 1.02 |
| | 12 | 6.3 | 23.7 | 36.400 | 23.7 | 36.392 | 0.95 | 0.066 | 2.27 | 1.15 |
| 7a | 1 | 85.4 | 16.5 | 36.162 | 16.4 | 36.160 | 0.95 | 0.188 | 0.17 | 0.38 |
| | 2 | 86.1 | 16.4 | 36.168 | 16.4 | 36.164 | 0.94 | 0.212 | 0.15 | 0.37 |
| | 3 | 85.8 | 16.4 | 36.167 | 16.4 | 36.165 | 0.94 | 0.214 | 0.14 | 0.37 |
| | 4 | 85.9 | 16.4 | 36.164 | 16.4 | 36.162 | 0.94 | 0.213 | 0.13 | 0.36 |
| | 5 | 85.6 | 16.4 | 36.164 | 16.4 | 36.163 | 0.94 | 0.212 | 0.13 | 0.36 |
| | 6 | 85.6 | 16.4 | 36.163 | 16.4 | 36.162 | 0.94 | 0.220 | 0.13 | 0.36 |
| | 7 | 20.2 | 23.1 | 36.529 | 23.1 | 36.524 | 0.95 | 0.070 | 1.45 | 0.38 |
| | 8 | 20.3 | 23.2 | 36.529 | 23.2 | 36.526 | 0.95 | 0.070 | 1.46 | 0.38 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 7a | 9 | 20.4 | 23.2 | 36.528 | 23.2 | 36.524 | 0.95 | 0.070 | 1.46 | 0.38 |
| | 10 | 20.5 | 23.2 | 36.533 | 23.2 | 36.532 | 0.95 | 0.070 | 1.46 | 0.39 |
| | 11 | 20.4 | 23.1 | 36.537 | 23.1 | 36.532 | 0.95 | 0.070 | 1.47 | 0.39 |
| | 12 | 20.3 | 23.1 | 36.537 | 23.1 | 36.532 | 0.95 | 0.070 | 1.48 | 0.40 |
| 8 | 1 | 250.0 | 14.8 | 36.050 | 14.8 | 36.046 | 0.96 | 0.062 | 0.00 | 1.53 |
| | 2 | 160.8 | 16.1 | 36.242 | 16.1 | 36.239 | 0.96 | 0.066 | 0.00 | 1.60 |
| | 3 | 121.2 | 17.0 | 36.404 | 17.0 | 36.401 | 0.96 | 0.085 | 0.27 | 1.51 |
| | 4 | 101.6 | 17.5 | 36.520 | 17.5 | 36.517 | 0.96 | 0.104 | 0.53 | 1.18 |
| | 5 | 91.8 | 17.6 | 36.526 | 17.6 | 36.522 | 0.96 | 0.117 | 0.63 | 0.95 |
| | 6 | 76.6 | 17.9 | 36.540 | 17.9 | 36.533 | 0.96 | 0.147 | 0.99 | 0.98 |
| | 7 | 76.6 | 17.9 | 36.540 | 17.9 | 36.536 | 0.96 | 0.159 | 1.06 | 1.02 |
| | 8 | 76.8 | 17.9 | 36.540 | 17.9 | 36.536 | 0.95 | 0.152 | 1.08 | 1.04 |
| | 9 | 61.2 | 18.2 | 36.540 | 18.1 | 36.533 | 0.96 | 0.139 | 1.48 | 1.08 |
| | 10 | 42.0 | 20.1 | 36.612 | 20.1 | 36.609 | 0.96 | 0.075 | 1.89 | 1.13 |
| | 11 | 21.8 | 22.6 | 36.838 | 22.4 | 36.818 | 0.96 | 0.066 | 2.23 | 1.04 |
| | 12 | 11.5 | 23.9 | 36.915 | 23.9 | 36.912 | 0.96 | 0.065 | 2.50 | 1.29 |
| 9 | 1 | 249.9 | 15.7 | 36.231 | 15.7 | 36.228 | 0.96 | 0.071 | 0.00 | 1.41 |
| | 2 | 180.0 | 17.3 | 36.503 | 17.3 | 36.504 | 0.96 | 0.083 | 0.00 | 1.04 |
| | 3 | 160.2 | 17.6 | 36.574 | 17.6 | 36.567 | 0.96 | 0.086 | 0.00 | 1.43 |
| | 4 | 140.2 | 18.2 | 36.661 | 18.1 | 36.653 | 0.96 | 0.103 | 0.00 | 1.43 |
| | 5 | 130.5 | 18.5 | 36.704 | 18.5 | 36.702 | 0.96 | 0.117 | 0.19 | 1.44 |
| | 6 | 118.2 | 18.9 | 36.782 | 18.9 | 36.779 | 0.96 | 0.124 | 0.48 | 1.45 |
| | 7 | 118.5 | 18.9 | 36.783 | 18.9 | 36.780 | 0.96 | 0.125 | 0.48 | 1.46 |
| | 8 | 118.3 | 18.9 | 36.784 | 18.9 | 36.781 | 0.96 | 0.126 | 0.49 | 1.47 |
| | 9 | 80.3 | 20.4 | 36.810 | 20.3 | 36.806 | 0.96 | 0.098 | 1.41 | 1.47 |
| | 10 | 40.2 | 23.7 | 37.195 | 23.8 | 37.194 | 0.96 | 0.078 | 2.17 | 1.45 |
| | 11 | 20.7 | 24.3 | 37.189 | 24.3 | 37.181 | 0.96 | 0.074 | 2.49 | 1.45 |
| | 12 | 10.9 | 24.6 | 37.193 | 24.6 | 37.190 | 0.96 | 0.071 | 2.63 | 1.44 |
| 10 | 1 | 251.2 | 16.4 | 36.328 | 16.4 | 36.324 | 0.96 | 0.066 | 0.00 | 1.43 |
| | 2 | 180.7 | 17.6 | 36.562 | 17.7 | 36.568 | 0.96 | 0.071 | 0.00 | 1.42 |
| | 3 | 151.1 | 18.6 | 36.739 | 18.6 | 36.736 | 0.96 | 0.076 | 0.00 | 1.40 |
| | 4 | 120.9 | 19.5 | 36.908 | 19.5 | 36.904 | 0.96 | 0.093 | 0.17 | 1.40 |
| | 5 | 101.2 | 20.1 | 37.016 | 20.1 | 37.013 | 0.96 | 0.113 | 0.59 | 1.41 |
| | 6 | 91.1 | 20.4 | 37.044 | 20.4 | 37.040 | 0.96 | 0.120 | 0.80 | 1.35 |
| | 7 | 91.1 | 20.4 | 37.048 | 20.4 | 37.045 | 0.96 | 0.118 | 0.80 | 1.32 |
| | 8 | 91.3 | 20.4 | 37.048 | 20.4 | 37.045 | 0.96 | 0.119 | 0.83 | 1.42 |
| | 9 | 76.6 | 21.0 | 37.098 | 21.1 | 37.097 | 0.96 | 0.121 | 1.20 | 1.41 |
| | 10 | 40.8 | 24.8 | 37.075 | 24.8 | 37.090 | 0.95 | 0.089 | 1.89 | 1.38 |
| | 11 | 21.8 | 24.9 | 36.909 | 24.9 | 36.907 | 0.95 | 0.084 | 2.39 | 1.41 |
| | 12 | 11.4 | 24.9 | 36.900 | 24.9 | 36.897 | 0.95 | 0.076 | 2.62 | 1.41 |
| 11 | 1 | 244.9 | 13.2 | 35.654 | 13.2 | 35.651 | 0.96 | 0.084 | 0.00 | 1.29 |
| | 2 | 162.0 | 14.0 | 35.712 | 14.0 | 35.709 | 0.96 | 0.087 | 0.00 | 1.42 |
| | 3 | 119.8 | 14.2 | 35.667 | 14.2 | 35.663 | 0.95 | 0.091 | 0.00 | 1.42 |
| | 4 | 61.2 | 16.0 | 35.878 | 16.0 | 35.875 | 0.95 | 0.123 | 0.41 | 1.42 |
| | 5 | 42.1 | 16.7 | 35.885 | 16.7 | 35.884 | 0.94 | 0.220 | 1.06 | 1.42 |
| | 6 | 42.3 | 16.7 | 35.895 | 16.7 | 35.891 | 0.94 | 0.214 | 1.04 | 1.42 |
| | 7 | 30.5 | 20.2 | 35.983 | 19.9 | 36.027 | 0.92 | 0.473 | 1.61 | 1.41 |
| | 8 | 30.5 | 22.6 | 36.173 | 22.5 | 36.164 | 0.91 | 0.358 | 1.62 | 1.41 |
| | 9 | 27.2 | 24.9 | 36.270 | 24.9 | 36.262 | 0.92 | 0.281 | 1.78 | 1.41 |
| | 10 | 22.4 | 25.1 | 36.275 | 25.1 | 36.273 | 0.91 | 0.315 | 1.99 | 1.41 |
| | 11 | 12.2 | 25.2 | 36.287 | 25.2 | 36.284 | 0.91 | 0.246 | 2.42 | 1.41 |
| | 12 | 3.5 | 25.3 | 36.291 | 25.3 | 36.289 | 0.91 | 0.144 | 2.82 | 1.41 |
| 12 | 1 | 250.2 | 11.1 | 35.082 | 11.1 | 35.077 | 0.96 | 0.082 | 0.00 | 1.41 |
| | 2 | 160.4 | 12.3 | 35.225 | 12.3 | 35.224 | 0.96 | 0.083 | 0.00 | 0.92 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 3 | 100.4 | 14.1 | 35.443 | 14.1 | 35.441 | 0.96 | 0.111 | 0.00 | 1.04 |
| | 4 | 79.7 | 15.1 | 35.557 | 15.2 | 35.556 | 0.95 | 0.140 | 0.27 | 1.71 |
| | 5 | 60.1 | 16.4 | 35.642 | 16.5 | 35.645 | 0.95 | 0.181 | 0.85 | 1.71 |
| | 6 | 49.8 | 17.7 | 35.701 | 17.6 | 35.694 | 0.94 | 0.242 | 1.19 | 1.61 |
| | 7 | 43.5 | 19.2 | 35.807 | 19.2 | 35.804 | 0.92 | 0.366 | 1.35 | 1.14 |
| | 8 | 43.8 | 19.3 | 35.820 | 19.3 | 35.818 | 0.92 | 0.367 | 1.53 | 1.75 |
| | 9 | 30.5 | 21.8 | 35.884 | 22.1 | 35.810 | 0.93 | 0.161 | 2.08 | 1.72 |
| | 10 | 20.2 | 27.0 | 35.798 | 26.9 | 35.806 | 0.94 | 0.105 | 2.37 | 1.64 |
| | 11 | 10.7 | 28.4 | 35.708 | 28.4 | 35.708 | 0.94 | 0.094 | 2.62 | 1.61 |
| | 12 | 5.6 | 28.6 | 35.690 | 28.6 | 35.694 | 0.94 | 0.091 | 2.77 | 1.62 |
| 13 | 1 | 251.4 | 11.6 | 35.149 | 11.6 | 35.146 | 0.95 | 0.083 | 0.00 | 0.94 |
| | 2 | 161.2 | 12.9 | 35.278 | 12.9 | 35.277 | 0.95 | 0.081 | 0.00 | 1.02 |
| | 3 | 120.8 | 13.7 | 35.386 | 13.8 | 35.379 | 0.95 | 0.085 | 0.00 | 1.02 |
| | 4 | 101.2 | 14.7 | 35.490 | 14.6 | 35.482 | 0.95 | 0.099 | 0.00 | 1.01 |
| | 5 | 81.1 | 16.4 | 35.641 | 16.4 | 35.635 | 0.95 | 0.128 | 0.42 | 1.01 |
| | 6 | 66.0 | 18.1 | 35.756 | 18.4 | 35.782 | 0.95 | 0.148 | 0.80 | 1.00 |
| | 7 | 48.5 | 21.4 | 35.936 | 21.6 | 35.937 | 0.94 | 0.247 | 1.46 | 0.99 |
| | 8 | 48.2 | 21.7 | 35.941 | 21.8 | 35.942 | 0.93 | 0.272 | 1.44 | 1.00 |
| | 9 | 41.1 | 22.8 | 35.967 | 22.9 | 35.986 | 0.93 | 0.265 | 1.78 | 1.03 |
| | 10 | 31.1 | 26.4 | 35.690 | 26.2 | 35.717 | 0.94 | 0.106 | 2.15 | 1.09 |
| | 11 | 21.2 | 28.0 | 34.840 | 28.0 | 34.825 | 0.95 | 0.088 | 2.38 | 1.08 |
| | 12 | 3.5 | 28.1 | 34.306 | 28.1 | 34.308 | 0.95 | 0.077 | 2.89 | 1.05 |
| 14 | 1 | 248.8 | 12.8 | 35.249 | 12.8 | 35.245 | 0.95 | 0.079 | 0.00 | 0.87 |
| | 2 | 179.8 | 13.7 | 35.363 | 13.7 | 35.360 | 0.95 | 0.080 | 0.00 | 0.78 |
| | 3 | 151.0 | 13.9 | 35.396 | 13.9 | 35.393 | 0.95 | 0.081 | 0.00 | 0.72 |
| | 4 | 125.8 | 14.5 | 35.463 | 14.5 | 35.464 | 0.95 | 0.090 | 0.00 | 0.70 |
| | 5 | 100.7 | 17.1 | 35.668 | 17.3 | 35.676 | 0.95 | 0.124 | 0.22 | 0.68 |
| | 6 | 86.0 | 19.8 | 35.841 | 19.8 | 35.837 | 0.95 | 0.137 | 0.60 | 0.66 |
| | 7 | 75.8 | 25.4 | 35.899 | 25.4 | 35.889 | 0.94 | 0.193 | 0.89 | 0.64 |
| | 8 | 76.2 | 25.4 | 35.908 | 25.4 | 35.908 | 0.94 | 0.195 | 0.87 | 0.63 |
| | 9 | 60.4 | 26.9 | 35.838 | 27.1 | 35.825 | 0.95 | 0.117 | 1.21 | 0.64 |
| | 10 | 40.4 | 27.6 | 35.674 | 27.6 | 35.683 | 0.94 | 0.093 | 1.56 | 0.65 |
| | 11 | 21.0 | 27.6 | 35.561 | 27.6 | 35.559 | 0.94 | 0.088 | 1.94 | 0.66 |
| | 12 | 2.5 | 27.6 | 35.562 | 27.6 | 35.560 | 0.94 | 0.086 | 2.44 | 0.67 |
| 15 | 1 | 248.3 | 12.1 | 35.165 | 12.1 | 35.161 | 0.96 | 0.078 | 0.00 | 1.53 |
| | 2 | 177.1 | 13.9 | 35.392 | 13.9 | 35.389 | 0.96 | 0.075 | 0.00 | 1.15 |
| | 3 | 134.8 | 14.8 | 35.517 | 14.8 | 35.514 | 0.96 | 0.079 | 0.00 | 0.82 |
| | 4 | 91.6 | 16.9 | 35.818 | 16.9 | 35.814 | 0.96 | 0.095 | 0.70 | 1.53 |
| | 5 | 72.1 | 24.5 | 36.623 | 24.5 | 36.617 | 0.95 | 0.160 | 1.06 | 1.13 |
| | 6 | 62.0 | 25.0 | 36.266 | 25.0 | 36.252 | 0.95 | 0.225 | 1.41 | 1.47 |
| | 7 | 61.3 | 25.1 | 36.215 | 25.1 | 36.213 | 0.95 | 0.230 | 1.36 | 1.26 |
| | 8 | 62.1 | 25.1 | 36.246 | 25.1 | 36.243 | 0.95 | 0.230 | 1.05 | 1.24 |
| | 9 | 48.4 | 25.8 | 36.113 | 25.8 | 36.110 | 0.95 | 0.191 | 1.61 | 0.89 |
| | 10 | 38.5 | 25.9 | 36.099 | 25.9 | 36.096 | 0.95 | 0.147 | 2.04 | 1.56 |
| | 11 | 19.2 | 26.0 | 36.087 | 26.0 | 36.084 | 0.95 | 0.087 | 2.45 | 1.56 |
| | 12 | 1.1 | 26.1 | 36.088 | 26.1 | 36.085 | 0.95 | 0.073 | 2.69 | 0.94 |
| 16 | 1 | 250.5 | 10.1 | 34.915 | 10.1 | 34.909 | 0.96 | 0.078 | 0.00 | 1.41 |
| | 2 | 180.6 | 12.3 | 35.189 | 12.3 | 35.185 | 0.96 | 0.078 | 0.00 | 1.41 |
| | 3 | 140.2 | 16.2 | 35.664 | 16.2 | 35.660 | 0.96 | 0.096 | 0.00 | 0.46 |
| | 4 | 120.7 | 19.6 | 36.001 | 19.5 | 35.992 | 0.96 | 0.108 | 0.00 | 0.44 |
| | 5 | 100.7 | 23.6 | 35.888 | 23.4 | 35.919 | 0.95 | 0.161 | 0.40 | 0.44 |
| | 6 | 90.9 | 24.1 | 35.854 | 24.1 | 35.856 | 0.95 | 0.196 | 0.66 | 0.45 |
| | 7 | 83.9 | 24.8 | 35.901 | 24.8 | 35.899 | 0.95 | 0.238 | 0.86 | 0.44 |
| | 8 | 83.9 | 25.0 | 35.925 | 25.0 | 35.923 | 0.95 | 0.246 | 0.86 | 0.44 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 9 | 66.1 | 25.1 | 35.912 | 25.1 | 35.910 | 0.95 | 0.224 | 1.34 | 0.44 |
| | 10 | 41.0 | 25.4 | 35.912 | 25.4 | 35.910 | 0.95 | 0.136 | 1.98 | 0.45 |
| | 11 | 21.1 | 25.4 | 35.922 | 25.4 | 35.918 | 0.95 | 0.104 | 2.41 | 0.45 |
| | 12 | 3.2 | 25.6 | 35.926 | 25.6 | 35.924 | 0.95 | 0.081 | 2.89 | 0.45 |
| 17 | 1 | 250.9 | 10.8 | 34.980 | 10.8 | 34.977 | 0.96 | 0.076 | 0.00 | 0.70 |
| | 2 | 200.7 | 13.3 | 35.273 | 13.3 | 35.274 | 0.96 | 0.076 | 0.00 | 0.59 |
| | 3 | 180.7 | 14.6 | 35.458 | 14.7 | 35.488 | 0.96 | 0.083 | 0.00 | 0.56 |
| | 4 | 160.5 | 16.5 | 35.772 | 16.5 | 35.762 | 0.96 | 0.098 | 0.02 | 0.56 |
| | 5 | 140.6 | 20.1 | 36.331 | 20.0 | 36.309 | 0.95 | 0.132 | 0.44 | 0.57 |
| | 6 | 131.4 | 20.5 | 36.387 | 20.5 | 36.387 | 0.95 | 0.141 | 0.65 | 0.56 |
| | 7 | 121.1 | 22.5 | 36.691 | 22.5 | 36.686 | 0.95 | 0.168 | 0.92 | 0.65 |
| | 8 | 121.3 | 22.5 | 36.695 | 22.5 | 36.693 | 0.95 | 0.165 | 0.92 | 1.40 |
| | 9 | 101.1 | 25.2 | 36.834 | 25.2 | 36.841 | 0.95 | 0.108 | 1.35 | 1.43 |
| | 10 | 60.7 | 25.9 | 36.589 | 25.9 | 36.590 | 0.95 | 0.090 | 1.95 | 1.45 |
| | 11 | 21.3 | 26.2 | 36.523 | 26.2 | 36.520 | 0.95 | 0.076 | 2.46 | 1.48 |
| | 12 | 2.8 | 26.2 | 36.523 | 26.2 | 36.520 | 0.95 | 0.073 | 2.85 | 1.43 |
| 18 | 1 | 251.0 | 13.5 | 35.303 | 13.4 | 35.281 | 0.96 | 0.074 | 0.00 | 1.12 |
| | 2 | 219.8 | 15.1 | 35.532 | 15.1 | 35.545 | 0.96 | 0.078 | 0.00 | 1.17 |
| | 3 | 201.5 | 16.7 | 35.786 | 16.7 | 35.788 | 0.96 | 0.083 | 0.00 | 0.96 |
| | 4 | 191.9 | 17.6 | 35.931 | 17.6 | 35.933 | 0.96 | 0.087 | 0.00 | 0.94 |
| | 5 | 179.0 | 19.6 | 36.254 | 19.6 | 36.254 | 0.96 | 0.097 | 0.00 | 1.00 |
| | 6 | 170.8 | 20.5 | 36.405 | 20.6 | 36.416 | 0.96 | 0.106 | 0.00 | 0.96 |
| | 7 | 156.0 | 22.0 | 36.665 | 22.0 | 36.663 | 0.96 | 0.135 | 0.15 | 0.92 |
| | 8 | 156.2 | 22.2 | 36.691 | 22.2 | 36.686 | 0.95 | 0.138 | 0.15 | 0.93 |
| | 9 | 140.7 | 23.0 | 36.838 | 23.0 | 36.833 | 0.95 | 0.138 | 0.54 | 0.92 |
| | 10 | 101.3 | 24.9 | 37.145 | 24.8 | 37.142 | 0.95 | 0.093 | 1.10 | 0.83 |
| | 11 | 41.1 | 26.4 | 36.845 | 26.3 | 36.845 | 0.90 | 0.078 | 1.81 | 0.88 |
| | 12 | 20.4 | 26.4 | 36.841 | 26.4 | 36.838 | 0.93 | 0.074 | 1.98 | 1.02 |
| 19 | 1 | 250.9 | 15.8 | 35.571 | 15.8 | 35.550 | 0.96 | 0.072 | 0.00 | 1.11 |
| | 2 | 200.8 | 19.4 | 36.193 | 19.4 | 36.181 | 0.96 | 0.083 | 0.00 | 1.12 |
| | 3 | 180.6 | 21.3 | 36.579 | 21.4 | 36.590 | 0.96 | 0.100 | 0.00 | 1.21 |
| | 4 | 161.5 | 23.4 | 37.073 | 23.5 | 37.082 | 0.95 | 0.118 | 0.29 | 1.33 |
| | 5 | 151.4 | 23.8 | 37.143 | 23.8 | 37.142 | 0.95 | 0.120 | 0.49 | 1.13 |
| | 6 | 141.7 | 23.9 | 37.153 | 23.9 | 37.151 | 0.95 | 0.128 | 0.61 | 1.26 |
| | 7 | 141.1 | 23.9 | 37.158 | 23.9 | 37.155 | 0.95 | 0.129 | 0.62 | 1.25 |
| | 8 | 130.9 | 23.9 | 37.181 | 23.9 | 37.177 | 0.95 | 0.124 | 0.81 | 1.36 |
| | 9 | 120.8 | 23.9 | 37.135 | 23.9 | 37.130 | 0.95 | 0.115 | 1.06 | 1.50 |
| | 10 | 101.0 | 24.1 | 37.155 | 24.1 | 37.153 | 0.95 | 0.093 | 1.27 | 1.33 |
| | 11 | 51.1 | 24.6 | 37.153 | 24.6 | 37.149 | 0.95 | 0.076 | 1.81 | 1.28 |
| | 12 | 2.3 | 25.5 | 37.168 | 25.5 | 37.165 | 0.95 | 0.068 | 2.56 | 1.26 |
| 20 | 1 | 251.0 | 15.7 | 35.526 | 15.7 | 35.524 | 0.96 | 0.072 | 0.00 | 1.38 |
| | 2 | 200.1 | 18.0 | 35.928 | 18.0 | 35.925 | 0.96 | 0.078 | 0.00 | 1.38 |
| | 3 | 180.0 | 18.8 | 36.065 | 18.7 | 36.050 | 0.96 | 0.082 | 0.00 | 1.38 |
| | 4 | 160.5 | 20.0 | 36.291 | 19.9 | 36.260 | 0.95 | 0.102 | 0.16 | 1.38 |
| | 5 | 145.6 | 20.6 | 36.413 | 20.5 | 36.406 | 0.95 | 0.115 | 0.44 | 1.38 |
| | 6 | 137.6 | 21.6 | 36.649 | 21.6 | 36.647 | 0.95 | 0.138 | 0.62 | 1.38 |
| | 7 | 137.6 | 21.6 | 36.647 | 21.6 | 36.641 | 0.95 | 0.138 | 0.62 | 1.38 |
| | 8 | 125.4 | 22.8 | 36.898 | 22.8 | 36.897 | 0.95 | 0.126 | 0.85 | 1.38 |
| | 9 | 110.6 | 23.4 | 37.055 | 23.4 | 37.052 | 0.95 | 0.102 | 1.11 | 1.38 |
| | 10 | 60.8 | 23.7 | 37.121 | 23.7 | 37.118 | 0.95 | 0.085 | 1.62 | 1.38 |
| | 11 | 20.4 | 23.9 | 37.126 | 23.9 | 37.122 | 0.95 | 0.078 | 1.70 | 1.38 |
| | 12 | 2.1 | 23.9 | 37.126 | 23.9 | 37.123 | 0.95 | 0.073 | 2.79 | 1.38 |
| 21 | 1 | 252.4 | 15.2 | 35.476 | 15.1 | 35.470 | 0.96 | 0.074 | 0.00 | 1.04 |
| | 2 | 201.7 | 16.3 | 35.635 | 16.3 | 35.631 | 0.96 | 0.074 | 0.00 | 1.03 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $PAR_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 3 | 179.2 | 17.2 | 35.794 | 17.3 | 35.803 | 0.96 | 0.076 | 0.00 | 1.03 |
| | 4 | 141.7 | 18.7 | 36.058 | 18.6 | 36.046 | 0.95 | 0.092 | 0.00 | 1.04 |
| | 5 | 121.2 | 19.4 | 36.184 | 19.4 | 36.192 | 0.95 | 0.108 | 0.27 | 0.97 |
| | 6 | 108.6 | 20.3 | 36.345 | 20.3 | 36.342 | 0.95 | 0.132 | 0.51 | 0.95 |
| | 7 | 107.9 | 20.4 | 36.357 | 20.4 | 36.353 | 0.95 | 0.135 | 0.54 | 0.98 |
| | 8 | 102.0 | 20.6 | 36.401 | 20.6 | 36.399 | 0.95 | 0.138 | 0.69 | 0.98 |
| | 9 | 81.1 | 22.1 | 36.683 | 22.2 | 36.686 | 0.95 | 0.111 | 1.14 | 1.02 |
| | 10 | 51.7 | 22.8 | 36.805 | 22.8 | 36.802 | 0.95 | 0.092 | 1.62 | 1.08 |
| | 11 | 20.5 | 22.8 | 36.799 | 22.8 | 36.795 | 0.95 | 0.084 | 2.07 | 1.10 |
| | 12 | 3.2 | 22.8 | 36.797 | 22.8 | 36.793 | 0.95 | 0.076 | 2.52 | 1.08 |
| 22 | 1 | 252.3 | 13.8 | 35.305 | 13.8 | 35.302 | 0.96 | 0.075 | 0.00 | 0.39 |
| | 2 | 181.4 | 15.1 | 35.480 | 15.1 | 35.478 | 0.96 | 0.075 | 0.00 | 0.45 |
| | 3 | 161.8 | 15.8 | 35.581 | 15.7 | 35.566 | 0.96 | 0.076 | 0.00 | 0.47 |
| | 4 | 121.3 | 17.9 | 35.966 | 17.9 | 35.959 | 0.96 | 0.096 | 0.00 | 0.45 |
| | 5 | 96.9 | 20.3 | 36.445 | 20.2 | 36.440 | 0.95 | 0.107 | 0.06 | 0.40 |
| | 6 | 77.1 | 20.8 | 36.586 | 20.9 | 36.583 | 0.95 | 0.122 | 0.33 | 0.36 |
| | 7 | 61.6 | 20.9 | 36.591 | 20.9 | 36.588 | 0.95 | 0.124 | 0.57 | 0.33 |
| | 8 | 50.8 | 20.9 | 36.592 | 20.9 | 36.589 | 0.95 | 0.125 | 0.79 | 0.33 |
| | 9 | 37.3 | 20.9 | 36.592 | 20.9 | 36.589 | 0.95 | 0.123 | 1.26 | 0.43 |
| | 10 | 36.8 | 20.9 | 36.592 | 20.9 | 36.589 | 0.95 | 0.122 | 1.29 | 0.45 |
| | 11 | 21.2 | 20.9 | 36.592 | 20.9 | 36.589 | 0.95 | 0.126 | 1.63 | 0.48 |
| | 12 | 2.3 | 20.9 | 36.592 | 20.9 | 36.589 | 0.95 | 0.118 | 2.24 | 0.53 |
| 24 | 1 | 250.8 | 15.8 | 35.722 | 15.8 | 35.719 | 0.96 | 0.079 | 0.00 | 1.06 |
| | 2 | 202.2 | 16.0 | 35.734 | 16.0 | 35.733 | 0.96 | 0.080 | 0.00 | 1.06 |
| | 3 | 161.6 | 16.8 | 35.872 | 16.9 | 35.877 | 0.96 | 0.081 | 0.00 | 1.17 |
| | 4 | 121.8 | 17.9 | 36.062 | 17.9 | 36.054 | 0.96 | 0.082 | 0.00 | 1.20 |
| | 5 | 90.9 | 18.2 | 36.093 | 18.2 | 36.090 | 0.96 | 0.085 | 0.00 | 1.14 |
| | 6 | 70.8 | 19.3 | 36.263 | 19.3 | 36.259 | 0.96 | 0.103 | 0.15 | 1.11 |
| | 7 | 55.3 | 19.0 | 36.069 | 19.0 | 36.069 | 0.94 | 0.184 | 0.52 | 1.08 |
| | 8 | 45.4 | 19.0 | 36.077 | 19.0 | 36.073 | 0.93 | 0.227 | 0.83 | 1.08 |
| | 9 | 37.2 | 19.2 | 36.128 | 19.2 | 36.125 | 0.93 | 0.223 | 1.12 | 1.07 |
| | 10 | 36.9 | 19.2 | 36.134 | 19.2 | 36.130 | 0.93 | 0.218 | 1.14 | 1.07 |
| | 11 | 20.7 | 18.7 | 35.870 | 18.7 | 35.862 | 0.92 | 0.162 | 1.73 | 1.07 |
| | 12 | 2.6 | 18.7 | 35.868 | 18.7 | 35.866 | 0.93 | 0.136 | 2.49 | 1.10 |
| 25 | 1 | 252.7 | 14.3 | 35.616 | 14.3 | 35.613 | 0.96 | 0.095 | 0.00 | 1.43 |
| | 2 | 161.9 | 14.1 | 35.566 | 14.1 | 35.562 | 0.96 | 0.104 | 0.00 | 1.52 |
| | 3 | 102.1 | 14.1 | 35.547 | 14.1 | 35.546 | 0.96 | 0.107 | 0.00 | 0.46 |
| | 4 | 71.8 | 14.2 | 35.564 | 14.2 | 35.560 | 0.96 | 0.116 | 0.00 | 1.60 |
| | 5 | 51.7 | 14.3 | 35.566 | 14.3 | 35.563 | 0.94 | 0.177 | 0.00 | 0.44 |
| | 6 | 41.3 | 14.3 | 35.564 | 14.3 | 35.561 | 0.93 | 0.252 | 0.11 | 0.41 |
| | 7 | 31.6 | 14.3 | 35.556 | 14.3 | 35.552 | 0.91 | 0.308 | 0.51 | 0.42 |
| | 8 | 25.1 | 14.3 | 35.555 | 14.3 | 35.552 | 0.91 | 0.335 | 0.97 | 0.50 |
| | 9 | 25.5 | 14.3 | 35.557 | 14.3 | 35.554 | 0.91 | 0.323 | 1.30 | 0.75 |
| | 10 | 20.8 | 14.3 | 35.552 | 14.3 | 35.548 | 0.90 | 0.344 | 1.84 | 1.35 |
| | 11 | 11.2 | 14.3 | 35.549 | 14.3 | 35.546 | 0.90 | 0.292 | 2.31 | 1.57 |
| | 12 | 3.8 | 14.3 | 35.550 | 14.3 | 35.547 | 0.90 | 0.191 | 2.71 | 1.57 |
| 26 | 1 | 244.9 | 4.7 | 34.168 | 4.7 | 34.166 | 0.96 | 0.098 | 0.00 | 0.88 |
| | 2 | 157.9 | 6.1 | 34.272 | 6.1 | 34.271 | 0.96 | 0.102 | 0.00 | 0.87 |
| | 3 | 123.4 | 6.5 | 34.233 | 6.5 | 34.235 | 0.96 | 0.134 | 0.00 | 0.93 |
| | 4 | 89.2 | 8.1 | 34.385 | 8.1 | 34.383 | 0.96 | 0.104 | 0.00 | 0.92 |
| | 5 | 75.2 | 9.2 | 34.529 | 9.2 | 34.525 | 0.96 | 0.137 | 0.00 | 0.89 |
| | 6 | 65.2 | 9.7 | 34.622 | 9.7 | 34.620 | 0.95 | 0.154 | 0.15 | 0.87 |
| | 7 | 49.8 | 11.9 | 35.041 | 11.9 | 35.041 | 0.93 | 0.269 | 0.58 | 0.83 |
| | 8 | 35.4 | 12.6 | 35.214 | 12.6 | 35.214 | 0.93 | 0.267 | 1.04 | 0.85 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 26 | 9 | 26.2 | 12.3 | 35.131 | 12.3 | 35.128 | 0.93 | 0.300 | 1.39 | 0.88 |
| | 10 | 26.2 | 12.3 | 35.131 | 12.3 | 35.128 | 0.93 | 0.301 | 1.39 | 0.90 |
| | 11 | 11.0 | 12.2 | 35.096 | 12.2 | 35.093 | 0.92 | 0.253 | 2.04 | 0.95 |
| | 12 | 3.0 | 12.3 | 35.104 | 12.3 | 35.101 | 0.92 | 0.179 | 2.49 | 1.00 |
| 27 | 1 | 301.4 | 5.3 | 34.229 | 5.3 | 34.227 | 0.96 | 0.090 | 0.00 | 1.52 |
| | 2 | 251.4 | 6.0 | 34.284 | 6.0 | 34.282 | 0.96 | 0.091 | 0.00 | 1.50 |
| | 3 | 202.9 | 6.6 | 34.298 | 6.6 | 34.296 | 0.96 | 0.091 | 0.00 | 1.49 |
| | 4 | 150.9 | 8.6 | 34.513 | 8.7 | 34.506 | 0.96 | 0.093 | 0.00 | 1.52 |
| | 5 | 122.0 | 11.7 | 35.062 | 11.8 | 35.065 | 0.96 | 0.105 | 0.00 | 1.51 |
| | 6 | 92.3 | 13.1 | 35.377 | 13.1 | 35.378 | 0.96 | 0.116 | 0.00 | 1.51 |
| | 7 | 72.3 | 13.4 | 35.442 | 13.4 | 35.432 | 0.96 | 0.140 | 0.00 | 1.51 |
| | 8 | 52.2 | 13.0 | 35.292 | 13.0 | 35.295 | 0.94 | 0.237 | 0.43 | 1.51 |
| | 9 | 37.1 | 12.7 | 35.209 | 12.7 | 35.206 | 0.91 | 0.348 | 1.05 | 1.51 |
| | 10 | 22.2 | 12.9 | 35.245 | 12.8 | 35.217 | 0.91 | 0.359 | 1.71 | 1.48 |
| | 11 | 12.2 | 13.1 | 35.301 | 13.0 | 35.274 | 0.91 | 0.235 | 2.19 | 1.26 |
| | 12 | 3.7 | 13.1 | 35.305 | 13.1 | 35.304 | 0.91 | 0.179 | 2.67 | 1.48 |
| 28 | 1 | 251.0 | 4.2 | 34.155 | 4.2 | 34.153 | 0.96 | 0.094 | 0.00 | 1.34 |
| | 2 | 161.3 | 4.9 | 34.172 | 4.9 | 34.169 | 0.96 | 0.095 | 0.00 | 1.32 |
| | 3 | 121.3 | 5.5 | 34.192 | 5.5 | 34.192 | 0.96 | 0.096 | 0.00 | 1.32 |
| | 4 | 101.5 | 5.7 | 34.177 | 5.7 | 34.170 | 0.96 | 0.096 | 0.00 | 1.34 |
| | 5 | 80.9 | 7.5 | 34.177 | 7.6 | 34.172 | 0.95 | 0.146 | 0.00 | 1.32 |
| | 6 | 61.1 | 7.8 | 34.185 | 7.7 | 34.183 | 0.94 | 0.208 | 0.17 | 1.33 |
| | 7 | 51.4 | 7.8 | 34.189 | 7.8 | 34.187 | 0.94 | 0.238 | 0.25 | 1.04 |
| | 8 | 36.2 | 7.8 | 34.157 | 7.8 | 34.155 | 0.91 | 0.339 | 0.80 | 1.33 |
| | 9 | 36.3 | 7.8 | 34.165 | 7.8 | 34.162 | 0.91 | 0.330 | 0.78 | 1.30 |
| | 10 | 21.5 | 7.8 | 34.149 | 7.8 | 34.147 | 0.91 | 0.333 | 1.01 | 1.33 |
| | 11 | 11.3 | 7.8 | 34.145 | 7.8 | 34.143 | 0.91 | 0.291 | 1.27 | 1.33 |
| | 12 | 3.2 | 7.8 | 34.143 | 7.8 | 34.141 | 0.91 | 0.206 | 1.67 | 1.35 |
| 29 | 1 | 252.5 | 3.7 | 34.127 | 3.7 | 34.125 | 0.96 | 0.099 | 0.00 | 1.37 |
| | 2 | 161.9 | 4.1 | 34.128 | 4.1 | 34.126 | 0.96 | 0.103 | 0.00 | 0.58 |
| | 3 | 109.4 | 4.4 | 34.119 | 4.4 | 34.116 | 0.96 | 0.125 | 0.00 | 0.60 |
| | 4 | 90.5 | 4.9 | 34.119 | 4.9 | 34.117 | 0.96 | 0.132 | 0.00 | 1.04 |
| | 5 | 65.7 | 5.4 | 34.104 | 5.5 | 34.100 | 0.95 | 0.186 | 0.39 | 1.05 |
| | 6 | 55.9 | 5.8 | 34.111 | 5.8 | 34.107 | 0.95 | 0.183 | 0.61 | 1.09 |
| | 7 | 45.3 | 6.7 | 34.119 | 6.7 | 34.116 | 0.92 | 0.300 | 1.10 | 1.67 |
| | 8 | 35.7 | 7.0 | 34.123 | 7.0 | 34.117 | 0.93 | 0.291 | 1.44 | 1.74 |
| | 9 | 28.9 | 7.5 | 34.127 | 7.5 | 34.125 | 0.91 | 0.290 | 1.57 | 1.44 |
| | 10 | 21.0 | 7.7 | 34.132 | 7.7 | 34.129 | 0.91 | 0.260 | 1.77 | 1.20 |
| | 11 | 11.1 | 7.8 | 34.133 | 7.8 | 34.130 | 0.92 | 0.163 | 1.99 | 0.88 |
| | 12 | 3.1 | 7.8 | 34.133 | 7.8 | 34.131 | 0.92 | 0.146 | 2.28 | 0.75 |
| 30 | 1 | 251.7 | 4.9 | 34.125 | 4.9 | 34.123 | 0.96 | 0.086 | 0.00 | 0.77 |
| | 2 | 181.7 | 4.9 | 34.075 | 4.9 | 34.073 | 0.96 | 0.092 | 0.00 | 0.70 |
| | 3 | 151.5 | 4.9 | 34.052 | 4.9 | 34.050 | 0.96 | 0.101 | 0.00 | 0.73 |
| | 4 | 121.2 | 5.0 | 34.033 | 5.0 | 34.031 | 0.96 | 0.130 | 0.00 | 0.73 |
| | 5 | 101.0 | 5.0 | 34.028 | 5.0 | 34.025 | 0.96 | 0.138 | 0.00 | 0.73 |
| | 6 | 81.1 | 5.1 | 34.018 | 5.1 | 34.015 | 0.96 | 0.148 | 0.00 | 0.76 |
| | 7 | 61.3 | 5.3 | 33.973 | 5.3 | 33.971 | 0.95 | 0.205 | 0.32 | 0.77 |
| | 8 | 41.2 | 5.6 | 33.954 | 5.5 | 33.952 | 0.92 | 0.249 | 0.88 | 0.79 |
| | 9 | 30.9 | 5.6 | 33.949 | 5.6 | 33.947 | 0.92 | 0.240 | 1.24 | 0.85 |
| | 10 | 21.2 | 5.6 | 33.948 | 5.6 | 33.946 | 0.92 | 0.214 | 1.57 | 0.88 |
| | 11 | 11.2 | 5.6 | 33.948 | 5.6 | 33.946 | 0.92 | 0.183 | 1.94 | 0.84 |
| | 12 | 2.8 | 5.6 | 33.948 | 5.6 | 33.945 | 0.92 | 0.145 | 2.41 | 0.88 |
| 31 | 1 | 252.6 | 5.0 | 34.111 | 5.0 | 34.109 | 0.96 | 0.106 | 0.00 | 1.44 |
| | 2 | 181.7 | 5.0 | 34.039 | 5.0 | 34.036 | 0.96 | 0.123 | 0.00 | 1.48 |

**Table C2. (cont.)** A summary of the CTD Bottle Log for AMT-5.

| *Cast* | *Bottle* | *Depth* | $T_1$ | $S_1$ | $T_2$ | $S_2$ | $T_r$ | $F$ | PAR | $\mathrm{PAR}_S$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 3 | 151.3 | 5.1 | 34.024 | 5.1 | 34.018 | 0.96 | 0.127 | 0.00 | 1.51 |
| | 4 | 120.8 | 5.2 | 33.985 | 5.2 | 33.982 | 0.96 | 0.147 | 0.00 | 1.48 |
| | 5 | 100.7 | 5.3 | 33.966 | 5.3 | 33.964 | 0.95 | 0.167 | 0.00 | 1.21 |
| | 6 | 80.2 | 5.4 | 33.950 | 5.4 | 33.949 | 0.95 | 0.207 | 0.05 | 0.83 |
| | 7 | 60.7 | 5.6 | 33.949 | 5.6 | 33.947 | 0.93 | 0.239 | 0.57 | 0.85 |
| | 8 | 41.5 | 5.7 | 33.949 | 5.7 | 33.947 | 0.92 | 0.255 | 1.35 | 1.26 |
| | 9 | 31.3 | 5.7 | 33.949 | 5.7 | 33.947 | 0.92 | 0.222 | 1.73 | 1.49 |
| | 10 | 21.2 | 5.7 | 33.949 | 5.7 | 33.946 | 0.92 | 0.159 | 2.08 | 1.50 |
| | 11 | 11.4 | 5.7 | 33.949 | 5.7 | 33.947 | 0.92 | 0.147 | 2.41 | 1.46 |
| | 12 | 3.4 | 5.7 | 33.949 | 5.7 | 33.947 | 0.92 | 0.132 | 2.72 | 1.45 |

**Table D1.** A summary of the XBT casts for AMT-5. All times are in GMT.

| *Cast* | *Type* | *Date* | *Time* | *Longitude* | *Latitude* | *File Name* |
|---|---|---|---|---|---|---|
| 1 | T–7 | 18 September | 0700 | −12.450 | 48.105 | `amt5001.dat` |
| 2 | T–7 | 18 September | 1055 | −13.203 | 47.983 | `amt5002.dat` |
| 3 | T–7 | 18 September | 1614 | −14.730 | 47.697 | `amt5003.dat` |
| 4 | T–7 | 19 September | 0146 | −18.477 | 47.172 | `amt5004.dat` |
| 5 | T–7 | 19 September | 0738 | −18.950 | 46.467 | `amt5005.dat` |
| 6 | T–7 | 19 September | 1242 | −19.653 | 45.513 | `amt5006.dat` |
| 7 | T–7 | 19 September | 2202 | −20.000 | 43.502 | `amt5007.dat` |
| 8 | T–7 | 19 September | 2210 | −20.000 | 43.473 | `amt5008.dat` |
| 9 | T–7 | 20 September | 0142 | −19.960 | 42.843 | `amt5009.dat` |
| 10 | T–7 | 20 September | 1732 | −20.000 | 41.960 | `amt5010.dat` |
| 11 | T–7 | 20 September | 2213 | −20.000 | 41.070 | `amt5011.dat` |
| 12 | T–7 | 21 September | 0651 | −19.917 | 39.150 | `amt5012.dat` |
| 13 | T–5 | 21 September | 1203 | −20.000 | 38.717 | `amt5013.dat` |
| 14 | T–5 | 21 September | 1405 | −20.000 | 38.387 | `amt5014.dat` |
| 15 | T–5 | 21 September | 1558 | −20.000 | 38.050 | `amt5015.dat` |
| 16 | T–5 | 21 September | 1755 | −19.983 | 37.703 | `amt5016.dat` |
| 17 | T–5 | 21 September | 1804 | −19.972 | 37.660 | `amt5017.dat` |
| 18 | T–5 | 21 September | 1946 | −19.900 | 37.350 | `amt5018.dat` |
| 19 | T–5 | 21 September | 2202 | −19.850 | 37.050 | `amt5019.dat` |
| 20 | T–5 | 22 September | 0052 | −19.750 | 36.517 | `amt5020.dat` |
| 21 | T–5 | 22 September | 1204 | −19.492 | 35.412 | `amt5021.dat` |
| 22 | T–7 | 25 September | 2142 | −18.533 | 31.217 | `amt5022.dat` |
| 23 | T–7 | 26 September | 0832 | −20.523 | 29.422 | `amt5023.dat` |
| 24 | T–7 | 26 September | 1300 | −20.983 | 28.867 | `amt5024.dat` |
| 25 | T–7 | 26 September | 1841 | −20.987 | 27.747 | `amt5025.dat` |
| 26 | T–7 | 26 September | 2351 | −20.983 | 26.713 | `amt5026.dat` |
| 27 | T–7 | 27 September | 0900 | −20.983 | 24.575 | `amt5027.dat` |
| 28 | T–7 | 27 September | 1318 | −21.000 | 23.868 | `amt5028.dat` |
| 29 | T–7 | 27 September | 1850 | −20.998 | 22.852 | `amt5029.dat` |
| 30 | T–7 | 28 September | 0047 | −20.938 | 21.705 | `amt5030.dat` |
| 31 | T–5 | 28 September | 0534 | −20.747 | 20.743 | `amt5031.dat` |
| 32 | T–5 | 28 September | 0544 | −20.747 | 20.693 | `amt5032.dat` |
| 33 | T–5 | 28 September | 0918 | −20.588 | 20.017 | `amt5033.dat` |
| 34 | T–5 | 28 September | 1211 | −20.532 | 19.733 | `amt5034.dat` |
| 35 | T–5 | 28 September | 1723 | −20.390 | 18.888 | `amt5035.dat` |
| 36 | T–5 | 28 September | 2055 | −20.243 | 18.200 | `amt5036.dat` |
| 37 | T–5 | 29 September | 0117 | −20.067 | 17.450 | `amt5037.dat` |
| 38 | T–5 | 29 September | 0516 | −19.650 | 16.650 | `amt5038.dat` |
| 39 | T–5 | 29 September | 0710 | −20.000 | 16.267 | `amt5039.dat` |
| 40 | T–7 | 29 September | 1254 | −20.000 | 15.230 | `amt5040.dat` |

**Table D1.** A summary of the XBT casts for AMT-5. All times are in GMT.

| *Cast* | *Type* | *Date* | *Time* | *Longitude* | *Latitude* | *File Name* |
|---|---|---|---|---|---|---|
| 41 | T–7 | 29 September | 1854 | −19.993 | 14.000 | amt5041.dat |
| 42 | T–7 | 29 September | 2356 | −20.002 | 12.980 | amt5042.dat |
| 43 | T–7 | 30 September | 0915 | −20.738 | 11.230 | amt5043.dat |
| 44 | T–5 | 30 September | 1701 | −21.167 | 10.205 | amt5044.dat |
| 45 | T–5 | 30 September | 1855 | −21.335 | 9.887 | amt5045.dat |
| 46 | T–5 | 30 September | 2109 | −21.500 | 9.503 | amt5046.dat |
| 47 | T–5 | 30 September | 2310 | −21.630 | 9.152 | amt5047.dat |
| 48 | T–5 | 1 October | 0053 | −21.728 | 8.843 | amt5048.dat |
| 49 | T–5 | 1 October | 0302 | −21.863 | 8.447 | amt5049.dat |
| 50 | T–5 | 1 October | 0508 | −22.015 | 8.082 | amt5050.dat |
| 51 | T–5 | 1 October | 0707 | −22.171 | 7.696 | amt5051.dat |
| 52 | T–5 | 1 October | 0848 | −22.279 | 7.407 | amt5052.dat |
| 53 | T–5 | 1 October | 1155 | −22.468 | 7.027 | amt5053.dat |
| 54 | T–5 | 1 October | 1420 | −22.618 | 6.587 | amt5054.dat |
| 55 | T–5 | 1 October | 1617 | −22.747 | 6.257 | amt5055.dat |
| 56 | T–5 | 1 October | 1818 | −22.892 | 5.907 | amt5056.dat |
| 57 | T–5 | 1 October | 2035 | −23.067 | 5.491 | amt5057.dat |
| 58 | T–5 | 2 October | 0001 | −23.336 | 4.855 | amt5058.dat |
| 59 | T–5 | 2 October | 0202 | −23.491 | 4.478 | amt5059.dat |
| 60 | T–5 | 2 October | 0405 | −23.645 | 4.097 | amt5060.dat |
| 61 | T–5 | 2 October | 0611 | −23.798 | 3.707 | amt5061.dat |
| 62 | T–5 | 2 October | 0803 | −23.943 | 3.358 | amt5062.dat |
| 63 | T–5 | 2 October | 1009 | −24.108 | 2.952 | amt5063.dat |
| 64 | T–5 | 2 October | 1752 | −24.450 | 2.070 | amt5064.dat |
| 65 | T–5 | 2 October | 1840 | −24.505 | 1.940 | amt5065.dat |
| 66 | T–5 | 2 October | 2153 | −24.772 | 1.383 | amt5066.dat |
| 67 | T–5 | 2 October | 2325 | −24.850 | 1.185 | amt5067.dat |
| 68 | T–5 | 3 October | 0054 | −24.950 | 0.927 | amt5068.dat |
| 69 | T–5 | 3 October | 0522 | −25.267 | 0.133 | amt5069.dat |
| 70 | T–5 | 3 October | 0719 | −25.417 | −0.200 | amt5070.dat |
| 71 | T–5 | 3 October | 1303 | −25.692 | −0.827 | amt5071.dat |
| 72 | T–5 | 3 October | 1541 | −25.873 | −1.297 | amt5072.dat |
| 73 | T–5 | 3 October | 1958 | −26.067 | −1.803 | amt5073.dat |
| 74 | T–5 | 4 October | 0020 | −26.441 | −2.616 | amt5074.dat |
| 75 | T–7 | 4 October | 0921 | −27.190 | −4.363 | amt5075.dat |
| 76 | T–7 | 4 October | 1659 | −27.615 | −5.350 | amt5076.dat |
| 77 | T–7 | 4 October | 2127 | −27.990 | −6.248 | amt5077.dat |
| 78 | T–7 | 5 October | 0957 | −28.997 | −8.683 | amt5078.dat |
| 79 | T–7 | 5 October | 1750 | −29.390 | −9.633 | amt5079.dat |
| 80 | T–7 | 5 October | 2103 | −29.657 | −10.240 | amt5080.dat |
| 81 | T–7 | 6 October | 0130 | −29.967 | −11.067 | amt5081.dat |
| 82 | T–7 | 6 October | 1326 | −30.700 | −12.887 | amt5082.dat |
| 83 | T–7 | 6 October | 1712 | −30.945 | −13.467 | amt5083.dat |
| 84 | T–7 | 6 October | 2011 | −31.180 | −13.970 | amt5084.dat |
| 85 | T–7 | 6 October | 2322 | −31.425 | −14.477 | amt5085.dat |
| 86 | T–7 | 7 October | 0333 | −31.767 | −15.245 | amt5086.dat |
| 87 | T–7 | 7 October | 0919 | −32.204 | −16.293 | amt5087.dat |
| 88 | T–7 | 7 October | 1714 | −32.599 | −17.337 | amt5088.dat |
| 89 | T–7 | 7 October | 1955 | −32.798 | −17.820 | amt5089.dat |
| 90 | T–7 | 8 October | 0034 | −33.175 | −18.665 | amt5090.dat |
| 91 | T–7 | 8 October | 0950 | −34.038 | −20.383 | amt5091.dat |
| 93 | T–7 | 8 October | 2211 | −35.307 | −21.887 | amt5093.dat |
| 94 | T–7 | 9 October | 0903 | −36.900 | −23.508 | amt5094.dat |
| 95 | T–7 | 9 October | 1227 | −37.287 | −23.902 | amt5095.dat |
| 96 | T–7 | 9 October | 1907 | −38.346 | −24.995 | amt5096.dat |

**Table D1.** A summary of the XBT casts for AMT-5. All times are in GMT.

| *Cast* | *Type* | *Date* | *Time* | *Longitude* | *Latitude* | *File Name* |
|---|---|---|---|---|---|---|
| 97 | T–7 | 10 October | 0033 | −39.117 | −25.823 | `amt5097.dat` |
| 98 | T–7 | 10 October | 0756 | −40.393 | −27.065 | `amt5098.dat` |
| 99 | T–7 | 10 October | 1422 | −41.332 | −28.030 | `amt5099.dat` |
| 100 | T–7 | 10 October | 2015 | −42.287 | −29.072 | `amt5100.dat` |
| 101 | T–7 | 11 October | 0157 | −43.197 | −29.920 | `amt5101.dat` |
| 102 | T–7 | 11 October | 0914 | −44.395 | −31.170 | `amt5102.dat` |
| 103 | T–7 | 11 October | 1355 | −44.903 | −31.633 | `amt5103.dat` |
| 104 | T–7 | 11 October | 1931 | −45.877 | −32.638 | `amt5104.dat` |
| 105 | T–7 | 12 October | 0200 | −46.983 | −33.717 | `amt5105.dat` |
| 106 | T–7 | 12 October | 1143 | −48.732 | −35.355 | `amt5106.dat` |
| 107 | T–7 | 12 October | 1527 | −49.065 | −35.723 | `amt5107.dat` |
| 108 | T–7 | 12 October | 1904 | −49.482 | −36.113 | `amt5108.dat` |
| 109 | T–7 | 12 October | 2252 | −50.090 | −36.702 | `amt5109.dat` |
| 110 | T–7 | 13 October | 0140 | −50.460 | −37.060 | `amt5110.dat` |
| 111 | T–7 | 13 October | 0345 | −50.813 | −37.443 | `amt5111.dat` |
| 112 | T–5 | 13 October | 0810 | −51.420 | −38.227 | `amt5112.dat` |
| 113 | T–5 | 13 October | 1051 | −51.780 | −38.668 | `amt5113.dat` |
| 114 | T–5 | 13 October | 1726 | −52.105 | −39.198 | `amt5114.dat` |
| 115 | T–5 | 13 October | 1911 | −52.258 | −39.450 | `amt5115.dat` |
| 116 | T–5 | 13 October | 2059 | −52.468 | −39.733 | `amt5116.dat` |
| 117 | T–5 | 13 October | 2314 | −52.718 | −40.110 | `amt5117.dat` |
| 118 | T–5 | 14 October | 0131 | −52.983 | −40.412 | `amt5118.dat` |
| 119 | T–5 | 14 October | 0312 | −53.200 | −40.678 | `amt5119.dat` |
| 120 | T–5 | 14 October | 0506 | −53.424 | −40.981 | `amt5120.dat` |
| 121 | T–5 | 14 October | 0732 | −53.753 | −41.369 | `amt5121.dat` |
| 122 | T–5 | 14 October | 0910 | −53.964 | −41.651 | `amt5122.dat` |
| 122 | T–5 | 14 October | 1111 | −54.243 | −42.017 | `amt5123.dat` |
| 124 | T–5 | 14 October | 1349 | −54.505 | −42.247 | `amt5124.dat` |
| 125 | T–5 | 14 October | 1856 | −54.968 | −42.940 | `amt5125.dat` |
| 126 | T–5 | 14 October | 2000 | −55.105 | −43.162 | `amt5126.dat` |
| 127 | T–5 | 15 October | 0006 | −55.700 | −43.933 | `amt5127.dat` |
| 128 | T–5 | 15 October | 0219 | −55.953 | −44.262 | `amt5128.dat` |
| 129 | T–5 | 15 October | 0408 | −56.218 | −44.579 | `amt5129.dat` |
| 130 | T–5 | 15 October | 0607 | −56.515 | −44.925 | `amt5130.dat` |
| 131 | T–5 | 15 October | 0812 | −56.618 | −45.318 | `amt5131.dat` |
| 132 | T–5 | 15 October | 1008 | −56.667 | −45.689 | `amt5132.dat` |
| 133 | T–7 | 15 October | 1503 | −56.702 | −46.148 | `amt5133.dat` |
| 134 | T–7 | 15 October | 1748 | −56.753 | −46.540 | `amt5134.dat` |
| 135 | T–7 | 15 October | 2346 | −56.897 | −47.703 | `amt5135.dat` |
| 136 | T–7 | 16 October | 0147 | −56.960 | −48.095 | `amt5136.dat` |

**Table E1.** A summary of the SeaOPS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | *Assignments* | | | | *Down Cast* | | *CCD* | *Up Cast* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_s$ | $E_d/L_u$ | $P_1$ | $P_2$ | $P_1$ | $P_2$ | *Begin* | *End* | *Pic.* | *Begin* | *End* |
| 0 | 258 | 15 | −0.7067 | 50.5850 | 0654 | 0754 | I29 | R21 | $E_d$ | $L_u$ | 0811 | 0813 | | 0815 | 0816 |
| 1 | 259 | 30 | −1.6692 | 50.4278 | 1312 | 1312 | I29 | R21 | $E_d$ | $L_u$ | 1422 | 1425 | 1427 | 1428 | 1432 |
| 2 | 261 | 75 | −13.2058 | 47.9836 | 0944 | 0958 | I29 | R21 | $E_d$ | $L_u$ | 1011 | 1017 | 1020 | 1023 | 1029 |
| 3 | 262 | 75 | −18.4775 | 47.1710 | 0918 | 0918 | I29 | R21 | $E_d$ | $L_u$ | 1014 | 1021 | 1022 | 1023 | 1031 |
| 4 | 263 | 75 | −19.9598 | 42.8446 | 1002 | 1002 | I29 | R21 | $E_d$ | $L_u$ | 1010 | 1016 | 1019 | 1021 | 1028 |
| 5 | 264 | 100 | −20.0114 | 38.7162 | 0910 | 0910 | I29 | R21 | $E_d$ | $L_u$ | 1011 | 1019 | 1021 | 1022 | 1033 |
| 6 | 265 | 100 | −19.5233 | 35.4452 | 0937 | 0937 | I29 | R21 | $E_d$ | $L_u$ | 1007 | 1016 | 1019 | 1020 | 1030 |
| 7 | 268 | 125 | −17.2331 | 32.3105 | 1241 | 1241 | I29 | R21 | $E_d$ | $L_u$ | 1318 | 1329 | 1330 | 1331 | 1342 |
| 8 | 268 | 105 | −17.2187 | 32.3118 | | | I29 | R21 | $E_d$ | $L_u$ | 1359 | 1408 | | 1408 | 1418 |

**Table E1. (cont.)** A summary of the SeaOPS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | *Assignments* | | | | *Down Cast* | | *CCD* | *Up Cast* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_s$ | $E_d/L_u$ | $P_1$ | $P_2$ | $P_1$ | $P_2$ | *Begin* | *End* | *Pic.* | *Begin* | *End* |
| 9 | 269 | 125 | −20.9705 | 29.0486 | 1025 | 1025 | I29 | R21 | $E_d$ | $L_u$ | 1111 | 1122 | 1130 | 1124 | 1137 |
| 10 | 270 | 125 | −20.9991 | 24.1377 | 1030 | 1030 | I29 | R21 | $E_d$ | $L_u$ | 1107 | 1116 | | 1116 | 1125 |
| 11 | 270 | 75 | −20.9996 | 24.1396 | | | I29 | R21 | $E_d$ | $L_u$ | 1128 | 1136 | 1128 | 1137 | 1147 |
| 12 | 271 | 100 | −20.5287 | 19.7219 | 1046 | 1046 | I29 | R21 | $E_d$ | $L_u$ | 1107 | 1116 | 1130 | 1117 | 1137 |
| 13 | 271 | 75 | −20.5309 | 19.7290 | | | I29 | R21 | $E_d$ | $L_u$ | 1137 | 1144 | | 1145 | 1152 |
| 14 | 272 | 75 | −20.0112 | 15.4926 | 1035 | 1035 | I29 | R21 | $E_d$ | $L_u$ | 1106 | 1117 | | 1117 | 1124 |
| 15 | 273 | 100 | −20.8696 | 10.9225 | | | I29 | R21 | $E_d$ | $L_u$ | 1109 | 1118 | 1130 | 1120 | 1129 |
| 16 | 274 | 75 | −22.4690 | 7.0265 | 1044 | 1044 | I29 | R21 | $E_d$ | $L_u$ | 1111 | 1117 | 1120 | 1123 | 1130 |
| 17 | 274 | 75 | −22.4689 | 7.0272 | | | I29 | R21 | $E_d$ | $L_u$ | 1132 | 1138 | | 1138 | 1146 |
| 18 | 275 | 35 | −24.1642 | 2.8167 | 1048 | 1048 | I29 | I01 | $E_d$ | $E_d$ | 1106 | 1109 | 1115 | 1109 | 1112 |
| 19 | 275 | 35 | −24.1642 | 2.8150 | | 1117 | I29 | I40 | $E_d$ | $E_d$ | 1124 | 1127 | | 1127 | 1131 |
| 20 | 275 | 35 | −24.1636 | 2.8133 | | 1137 | R01 | R21 | $L_u$ | $L_u$ | 1143 | 1146 | | 1146 | 1149 |
| 21 | 275 | 35 | −24.1629 | 2.8118 | | 1154 | R35 | R21 | $L_u$ | $L_u$ | 1159 | 1202 | | 1203 | 1206 |
| 22 | 275 | 125 | −24.4572 | 2.0769 | 1642 | 1642 | I29 | R21 | $E_d$ | $L_u$ | 1652 | 1702 | 1706 | 1711 | 1728 |
| 23 | 276 | 110 | −25.6631 | −0.7728 | 1026 | 1026 | I29 | R21 | $E_d$ | $L_u$ | 1044 | 1056 | 1100 | 1103 | 1119 |
| 24 | 276 | 125 | −25.6639 | −0.7717 | | | I29 | R21 | $E_u$ | $L_u$ | 1129 | 1145 | 1212 | 1153 | 1209 |
| 25 | 277 | 125 | −27.3701 | −4.7853 | 1115 | 1115 | I29 | R21 | $E_d$ | $L_u$ | 1143 | 1154 | | 1154 | 1206 |
| 26 | 277 | 100 | −27.3744 | −4.7853 | | | I29 | R21 | $E_u$ | $L_u$ | 1213 | 1224 | 1210 | 1226 | 1236 |
| 27 | 277 | 125 | −27.3800 | −4.7855 | | | I29 | R21 | $E_d$ | $L_u$ | 1242 | 1253 | | 1253 | 1305 |
| 28 | 278 | 145 | −29.1152 | −8.9674 | 1116 | 1116 | I29 | R21 | $E_d$ | $L_u$ | 1139 | 1153 | 1156 | 1153 | 1213 |
| 29 | 279 | 35 | −30.7054 | −12.8766 | 1101 | 1101 | I29 | I40 | $E_d$ | $E_d$ | 1135 | 1138 | | 1144 | 1148 |
| 30 | 279 | 35 | −30.7047 | −12.8770 | | 1154 | I29 | I01 | $E_d$ | $E_d$ | 1200 | 1203 | | 1203 | 1206 |
| 31 | 279 | 35 | −30.7036 | −12.8787 | | 1212 | R01 | R21 | $L_u$ | $L_u$ | 1217 | 1220 | | 1221 | 1224 |
| 32 | 279 | 35 | −30.7022 | −12.8804 | | 1228 | R35 | R21 | $L_u$ | $L_u$ | 1234 | 1237 | | 1238 | 1242 |
| 33 | 279 | 90 | −30.7001 | −12.8832 | | 1246 | I29 | R21 | $E_d$ | $L_u$ | 1253 | 1303 | 1308 | 1305 | 1316 |
| 34 | 280 | 160 | −32.3624 | −16.6852 | 1054 | 1054 | I29 | R21 | $E_d$ | $L_u$ | 1137 | 1150 | 1155 | 1151 | 1205 |
| 35 | 280 | 150 | −32.5454 | −17.1483 | 1502 | 1502 | I29 | R21 | $E_d$ | $L_u$ | 1523 | 1536 | 1539 | 1537 | 1550 |
| 36 | 281 | 150 | −34.2248 | −20.6616 | 1106 | 1106 | I29 | R21 | $E_d$ | $L_u$ | 1143 | 1156 | 1200 | 1157 | 1210 |
| 37 | 281 | 50 | −34.2243 | −20.6632 | | 1215 | I29 | I40 | $E_d$ | $E_d$ | 1221 | 1225 | | 1225 | 1229 |
| 38 | 281 | 50 | −34.2244 | −20.6653 | | 1234 | I29 | I01 | $E_d$ | $E_d$ | 1239 | 1244 | | 1244 | 1248 |
| 39 | 281 | 50 | −34.2245 | −20.6679 | | 1256 | R01 | R21 | $L_u$ | $L_u$ | 1301 | 1305 | | 1305 | 1310 |
| 40 | 281 | 50 | −34.2249 | −20.6704 | | 1314 | R35 | R21 | $L_u$ | $L_u$ | 1320 | 1324 | | 1324 | 1329 |
| 41 | 282 | 100 | −37.2864 | −23.9030 | 1150 | 1150 | I29 | R21 | $E_d$ | $L_u$ | 1144 | 1153 | 1155 | 1153 | 1202 |
| 42 | 283 | 160 | −40.9804 | −27.6914 | 1104 | 1104 | I29 | R21 | $E_d$ | $L_u$ | 1137 | 1150 | 1153 | 1151 | 1205 |
| 43 | 284 | 100 | −44.8700 | −31.6209 | 1014 | 1014 | I40 | R35 | $E_d$ | $L_u$ | 1213 | 1221 | 1234 | 1221 | 1230 |
| 44 | 285 | 50 | −48.8622 | −35.4899 | 1227 | 1227 | I40 | R35 | $E_d$ | $L_u$ | 1244 | 1248 | 1250 | 1248 | 1252 |
| 45 | 286 | 100 | −51.9132 | −38.8361 | 1154 | 1154 | I40 | R35 | $E_d$ | $L_u$ | 1217 | 1226 | 1241 | 1226 | 1235 |
| 46 | 287 | 50 | −54.4622 | −42.2390 | 1146 | 1146 | I40 | R35 | $E_d$ | $L_u$ | 1241 | 1245 | | 1247 | 1252 |
| 47 | 287 | 50 | −54.4706 | −42.2404 | | | I40 | R35 | $E_d$ | $L_u$ | 1253 | 1257 | | 1257 | 1302 |
| 48 | 287 | 55 | −54.4767 | −42.2418 | | | I40 | R35 | $E_d$ | $L_u$ | 1302 | 1307 | | 1307 | 1312 |
| 49 | 287 | 60 | −54.4839 | −42.2433 | | | I40 | R35 | $E_d$ | $L_u$ | 1313 | 1318 | | 1319 | 1324 |
| 50 | 287 | 50 | −54.4936 | −42.2445 | | | I40 | R35 | $E_d$ | $L_u$ | 1325 | 1329 | 1339 | 1330 | 1334 |
| 51 | 287 | 50 | −54.8680 | −42.8034 | 1636 | 1636 | I40 | R35 | $E_d$ | $L_u$ | 1704 | 1708 | | 1708 | 1713 |
| 52 | 287 | 50 | −54.8693 | −42.8126 | | 1718 | I40 | I01 | $E_d$ | $E_d$ | 1724 | 1728 | 1730 | 1729 | 1734 |
| 53 | 287 | 50 | −54.8735 | −42.8192 | | 1738 | R01 | R35 | $L_u$ | $L_u$ | 1743 | 1746 | | 1747 | 1750 |
| 54 | 288 | 75 | −56.6875 | −46.0506 | 1136 | 1136 | I40 | R35 | $E_d$ | $L_u$ | 1305 | 1312 | | 1313 | 1320 |
| 55 | 288 | 75 | −56.6877 | −46.0473 | | | I40 | R35 | $E_d$ | $L_u$ | 1336 | 1342 | 1330 | 1342 | 1350 |
| 56 | 288 | 75 | −56.6873 | −46.0444 | | | I40 | R35 | $E_u$ | $L_u$ | 1357 | 1404 | | 1405 | 1416 |
| 57 | 289 | 75 | −57.6614 | −49.7933 | 1224 | 1224 | I01 | R35 | $E_d$ | $L_u$ | 1240 | 1247 | | 1256 | 1302 |
| 58 | 289 | 65 | −57.6643 | −49.7936 | | | I01 | R35 | $E_d$ | $L_u$ | 1308 | 1314 | | 1314 | 1320 |
| 59 | 289 | 75 | −57.6614 | −49.7933 | 1552 | 1558 | I01 | R35 | $E_d$ | $L_u$ | 1609 | 1615 | 1619 | 1623 | 1630 |
| 60 | 289 | 75 | −57.6614 | −49.7933 | | | I01 | R35 | $E_d$ | $L_u$ | 1630 | 1643 | | 1643 | 1655 |
| 61 | 289 | 75 | −57.6614 | −49.7933 | | | I01 | R35 | $E_d$ | $L_u$ | 1655 | 1702 | | 1702 | 1710 |
| 62 | 290 | 35 | −57.6948 | −51.6609 | 1108 | 1108 | I40 | R35 | $E_d$ | $L_u$ | 1133 | 1136 | | 1137 | 1140 |

**Table E1. (cont.)** A summary of the SeaOPS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | *Assignments* | | | | *Down Cast* | | *CCD* | *Up Cast* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_s$ | $E_d/L_u$ | $P_1$ | $P_2$ | $P_1$ | $P_2$ | *Begin* | *End* | *Pic.* | *Begin* | *End* |
| 63 | 290 | 35 | −57.6986 | −51.6624 | | | I40 | R35 | $E_d$ | $L_u$ | 1144 | 1147 | | 1147 | 1151 |
| 64 | 290 | 35 | −57.7008 | −51.6640 | | | I40 | R35 | $E_d$ | $L_u$ | 1152 | 1154 | 1159 | 1158 | 1201 |

**Table E2.** A summary of the SeaFALLS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | | *Down Cast* | | *CCD* |
|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_a$ | $E_w$ | $E_d/L_u$ | *Begin* | *End* | *Pic.* |
| 1 | 263 | 100 | −19.9607 | 42.4323 | 1342 | 1342 | 1342 | 1435 | 1437 | |
| 2 | 263 | 100 | −19.9608 | 42.4314 | | | | 1440 | 1442 | |
| 3 | 263 | 105 | −19.9608 | 42.4304 | | | | 1445 | 1447 | 1450 |
| 4 | 264 | 125 | −20.0129 | 38.7200 | 0906 | 0906 | 0906 | 1056 | 1059 | |
| 5 | 264 | 75 | −20.0133 | 38.7210 | | | | 1103 | 1105 | |
| 6 | 264 | 125 | −20.0130 | 38.7219 | | | | 1107 | 1110 | |
| 7 | 264 | 125 | −20.0123 | 38.7228 | | | | 1113 | 1116 | |
| 8 | 265 | 125 | −19.5281 | 35.4442 | 0939 | 1025 | 1025 | 1054 | 1057 | |
| 9 | 265 | 125 | −19.5287 | 35.4473 | | | | 1115 | 1117 | |
| 10 | 265 | 125 | −19.1433 | 35.0352 | 1424 | 1424 | 1424 | 1432 | 1435 | |
| 11 | 265 | 125 | −19.1411 | 35.0361 | | | | 1438 | 1441 | |
| 12 | 268 | 150 | −17.2250 | 32.3103 | 1240 | 1240 | 1240 | 1351 | 1354 | |
| 13 | 268 | 125 | −17.2217 | 32.3111 | | | | 1358 | 1401 | |
| 14 | 268 | 150 | −17.2179 | 32.3118 | | | | 1408 | 1411 | |
| 15 | 269 | 150 | −20.9702 | 29.0484 | 1032 | 1032 | 1240 | 1117 | 1120 | |
| 16 | 269 | 150 | −20.9712 | 29.0490 | | | | 1126 | 1129 | 1130 |
| 17 | 269 | 75 | −20.9718 | 29.0497 | | | | 1133 | 1135 | |
| 18 | 269 | 150 | −20.9723 | 29.0500 | | | | 1138 | 1141 | |
| 19 | 269 | 50 | −20.9730 | 29.0506 | | | | 1146 | 1147 | |
| 20 | 269 | 150 | −20.9735 | 29.0511 | | | | 1148 | 1151 | |
| 21 | 269 | 150 | −20.9929 | 28.6346 | 1401 | 1401 | 1401 | 1411 | 1414 | |
| 22 | 269 | 150 | −20.9943 | 28.6364 | | | | 1421 | 1424 | |
| 23 | 269 | 150 | −20.9954 | 28.6376 | | | | 1429 | 1432 | 1434 |
| 24 | 270 | 150 | −20.9990 | 24.1374 | 1029 | 1029 | 1029 | 1111 | 1114 | |
| 25 | 270 | 150 | −20.9995 | 24.1382 | | | | 1118 | 1121 | 1128 |
| 26 | 270 | 150 | −20.9994 | 24.1392 | | | | 1129 | 1132 | |
| 27 | 270 | 100 | −20.9996 | 24.1398 | | | | 1137 | 1139 | |
| 28 | 270 | 150 | −20.9996 | 24.1404 | | | | 1143 | 1146 | |
| 29 | 270 | 150 | −21.0087 | 23.7256 | 1359 | 1359 | 1359 | 1411 | 1414 | |
| 30 | 270 | 100 | −21.0085 | 23.7262 | | | | 1420 | 1422 | 1424 |
| 31 | 270 | 150 | −21.0083 | 23.7261 | | | | 1426 | 1429 | |
| 32 | 271 | 100 | −20.5285 | 19.7214 | 1049 | 1049 | 1049 | 1112 | 1114 | |
| 33 | 271 | 100 | −20.5290 | 19.7224 | | | | 1117 | 1119 | |
| 34 | 271 | 100 | −20.5294 | 19.7238 | | | | 1122 | 1124 | 1130 |
| 35 | 271 | 100 | −20.5306 | 19.7273 | | | | 1136 | 1138 | |
| 36 | 271 | 150 | −20.5309 | 19.7290 | | | | 1141 | 1144 | |
| 37 | 271 | 150 | −20.5315 | 19.7313 | | | | 1149 | 1152 | |
| 38 | 271 | 100 | −20.4177 | 19.0492 | 1559 | 1559 | 1559 | 1613 | 1615 | |
| 39 | 271 | 100 | −20.4166 | 19.0485 | | | | 1621 | 1623 | 1628 |
| 40 | 272 | 150 | −20.0106 | 15.4926 | 1039 | 1039 | 1039 | 1109 | 1111 | |
| 41 | 272 | 100 | −20.0129 | 15.4925 | | | | 1124 | 1126 | 1130 |
| 42 | 273 | 150 | −20.8696 | 10.9222 | 1035 | 1035 | 1035 | 1114 | 1117 | |
| 43 | 273 | 150 | −20.8701 | 10.9233 | | | | 1123 | 1126 | 1130 |
| 44 | 273 | 150 | −21.1762 | 10.2121 | 1607 | 1607 | 1607 | 1636 | 1639 | |
| 45 | 273 | 150 | −21.1752 | 10.2121 | | | | 1643 | 1646 | 1650 |

**Table E2. (cont.)** A summary of the SeaFALLS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | | *Down Cast* | | *CCD* |
|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_a$ | $E_w$ | $E_d/L_u$ | *Begin* | *End* | *Pic.* |
| 46 | 274 | 150 | −22.4698 | 7.0269 | 1043 | 1043 | 1043 | 1111 | 1114 | 1120 |
| 47 | 274 | 150 | −22.4690 | 7.0269 | | | | 1123 | 1126 | |
| 48 | 274 | 150 | −22.4690 | 7.0271 | | | | 1132 | 1135 | |
| 49 | 275 | | −24.1579 | 2.8406 | 1048 | | | | | |
| 50 | 275 | 150 | −24.4600 | 2.0770 | 1638 | 1638 | 1638 | 1652 | 1655 | 1120 |
| 51 | 275 | 150 | −24.4555 | 2.0758 | | | | 1711 | 1714 | |
| 52 | 275 | 150 | −24.4530 | 2.0746 | | | | 1721 | 1724 | |
| 53 | 275 | 150 | −24.4505 | 2.0727 | | | | 1731 | 1734 | |
| 54 | 276 | 150 | −25.6628 | −0.7728 | 1026 | 1026 | 1026 | 1050 | 1054 | 1100 |
| 55 | 276 | 145 | −25.6633 | −0.7726 | | | | 1103 | 1106 | |
| 56 | 276 | 135 | −25.6637 | −0.7716 | | | | 1115 | 1118 | |
| 57 | 276 | 150 | −25.6630 | −0.7713 | | | | 1129 | 1132 | |
| 58 | 276 | 120 | −25.6650 | −0.7699 | | | | 1140 | 1143 | |
| 59 | 276 | 130 | −25.6656 | −0.7699 | | | | 1222 | 1225 | |
| 60 | 276 | 150 | −25.8940 | −1.3585 | 1607 | 1607 | 1607 | 1617 | 1620 | |
| 61 | 276 | 150 | −25.8928 | −1.3580 | | | | 1629 | 1632 | |
| 62 | 276 | 150 | −25.8900 | −1.3588 | | | | 1638 | 1641 | |
| 63 | 277 | 150 | −27.3695 | −4.7856 | 1115 | 1115 | 1115 | 1148 | 1151 | |
| 64 | 277 | 150 | −27.3709 | −4.7853 | | | | 1157 | 1200 | |
| 65 | 277 | 150 | −27.3717 | −4.7851 | | | | 1204 | 1207 | |
| 66 | 277 | 150 | −27.3728 | −4.7852 | | | | 1213 | 1216 | 1210 |
| 67 | 277 | 165 | −27.3746 | −4.7854 | | | | 1223 | 1226 | |
| 68 | 277 | 150 | −27.3766 | −4.7856 | | | | 1234 | 1237 | |
| 69 | 277 | 150 | −27.3786 | −4.7857 | | | | 1243 | 1246 | |
| 70 | 277 | 150 | −27.3800 | −4.7855 | | | | 1250 | 1253 | |
| 71 | 277 | 150 | −27.3814 | −4.7854 | | | | 1257 | 1301 | |
| 72 | 277 | 150 | −27.3826 | −4.7855 | | | | 1305 | 1308 | |
| 73 | 277 | 150 | −27.5987 | −5.3100 | 1541 | 1541 | 1541 | 1608 | 1611 | |
| 74 | 277 | 125 | −27.5994 | −5.3117 | | | | 1617 | 1620 | |
| 75 | 277 | 150 | −27.6002 | −5.3126 | | | | 1624 | 1627 | |
| 76 | 277 | 175 | −27.6011 | −5.3139 | | | | 1632 | 1635 | 1637 |
| 77 | 278 | 175 | −29.1139 | −8.9644 | 1116 | 1116 | 1116 | 1242 | 1246 | |
| 78 | 278 | 175 | −29.1133 | −8.9635 | | | | 1254 | 1258 | |
| 79 | 278 | 175 | −29.1127 | −8.9625 | | | | 1304 | 1307 | |
| 80 | 278 | 150 | −29.3825 | −9.6149 | 1645 | 1645 | 1645 | 1720 | 1723 | 1725 |
| 81 | 278 | 150 | −29.3832 | −9.6158 | | | | 1728 | 1731 | |
| 82 | 279 | 175 | −30.7007 | −12.8821 | 1133 | 1133 | 1133 | 1250 | 1253 | |
| 83 | 279 | 175 | −30.6700 | −12.8833 | | | | 1301 | 1305 | 1308 |
| 84 | 279 | 100 | −30.6991 | −12.8841 | | | | 1311 | 1313 | |
| 85 | 279 | 100 | −30.6986 | −12.8847 | | | | 1316 | 1318 | |
| 86 | 280 | 190 | −32.5459 | −17.1484 | 1502 | 1502 | 1502 | 1524 | 1528 | |
| 87 | 280 | 200 | −32.5454 | −17.1483 | | | | 1533 | 1537 | 1539 |
| 88 | 280 | 200 | −32.5449 | −17.1488 | | | | 1543 | 1547 | |
| 89 | 280 | 200 | −32.5446 | −17.1497 | | | | 1553 | 1557 | |
| 90 | 281 | 185 | −34.2248 | −20.6616 | 1106 | 1106 | 1106 | 1152 | 1156 | 1200 |
| 91 | 281 | 165 | −34.2246 | −20.6619 | | | | 1202 | 1205 | |
| 92 | 281 | 185 | −34.2246 | −20.6624 | | | | 1211 | 1214 | |
| 93 | 281 | 190 | −34.2245 | −20.6629 | | | | 1220 | 1223 | |
| 94 | 281 | 205 | −34.2246 | −20.6637 | | | | 1229 | 1233 | |
| 95 | 281 | 200 | −34.2244 | −20.6652 | | | | 1239 | 1243 | |
| 96 | 281 | 185 | −34.2241 | −20.6664 | | | | 1248 | 1252 | |
| 97 | 281 | 215 | −34.2242 | −20.6676 | | | | 1257 | 1301 | |
| 98 | 281 | 235 | −34.2248 | −20.6686 | | | | 1308 | 1312 | |
| 99 | 281 | 180 | −34.2250 | −20.6702 | | | | 1319 | 1323 | |

**Table E2. (cont.)** A summary of the SeaFALLS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | | *Down Cast* | | *CCD* |
|---|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_a$ | $E_w$ | $E_d/L_u$ | *Begin* | *End* | *Pic.* |
| 100 | 281 | 220 | −34.2259 | −20.6715 | | | | 1330 | 1334 | |
| 101 | 281 | 150 | −34.5561 | −21.0816 | 1630 | 1630 | 1630 | 1648 | 1651 | |
| 102 | 281 | 150 | −34.5558 | −21.0818 | | | | 1655 | 1658 | |
| 103 | 285 | 100 | −48.8612 | −35.4852 | 1215 | | 1215 | 1302 | 1304 | |
| 104 | 285 | 85 | −48.8610 | −35.4833 | | | | 1310 | 1311 | |
| 105 | 285 | 100 | −48.8606 | −35.4813 | | | | 1316 | 1318 | |
| 106 | 285 | 80 | −48.8606 | −35.4800 | | | | 1322 | 1323 | |
| 107 | 285 | 90 | −48.8611 | −35.4783 | | | | 1327 | 1329 | |
| 108 | 285 | 90 | −49.4513 | −36.0912 | 1800 | | 1800 | 1806 | 1808 | |
| 109 | 285 | 90 | −49.4553 | −36.0930 | | | | 1818 | 1820 | |
| 110 | 285 | 90 | −49.4584 | −36.0941 | | | | 1829 | 1831 | |
| 111 | 285 | 90 | −49.4619 | −36.0951 | | | | 1843 | 1845 | |
| 112 | 286 | 75 | −51.9172 | −38.8352 | 1151 | | 1151 | 1300 | 1301 | |
| 113 | 286 | 105 | −51.9184 | −38.8359 | | | | 1305 | 1307 | |
| 114 | 286 | 90 | −51.9192 | −38.8365 | | | | 1309 | 1311 | |
| 115 | 286 | 100 | −51.9200 | −38.8375 | | | | 1315 | 1317 | |
| 116 | 286 | 90 | −51.9202 | −38.8384 | | | | 1320 | 1322 | |
| 117 | 286 | 100 | −51.9206 | −38.8391 | | | | 1325 | 1327 | |
| 118 | 286 | 100 | −51.9213 | −38.8401 | | | | 1333 | 1335 | |
| 119 | 286 | 100 | −51.9215 | −38.8408 | | | | 1338 | 1340 | |
| 120 | 286 | 100 | −52.1224 | −39.1983 | 1613 | | 1613 | 1652 | 1654 | |
| 121 | 286 | 90 | −52.1174 | −39.1989 | | | | 1659 | 1701 | |
| 122 | 286 | 100 | −52.1077 | −39.1994 | | | | 1713 | 1715 | |
| 123 | 287 | 90 | −54.4631 | −42.2391 | 1140 | | 1140 | 1244 | 1246 | |
| 124 | 287 | 95 | −54.4698 | −42.2403 | | | | 1254 | 1256 | |
| 125 | 287 | 95 | −54.4767 | −42.2418 | | | | 1305 | 1307 | |
| 126 | 287 | 100 | −54.4840 | −42.2433 | | | | 1316 | 1318 | |
| 127 | 287 | 95 | −54.4874 | −42.2438 | | | | 1320 | 1322 | |
| 128 | 287 | 90 | −54.4919 | −42.2443 | | | | 1325 | 1327 | |
| 129 | 287 | 85 | −54.4969 | −42.2449 | | | | 1331 | 1333 | |
| 130 | 287 | 105 | −54.5004 | −42.2454 | | | | 1335 | 1337 | 1339 |
| 131 | 287 | 65 | −54.8776 | −42.8228 | 1638 | | 1638 | 1757 | 1759 | |
| 132 | 287 | 95 | −54.8783 | −42.8228 | | | | 1801 | 1803 | |
| 133 | 288 | 50 | −54.8776 | −42.8228 | 1152 | | 1152 | 1220 | 1221 | |
| 134 | 288 | 75 | −56.6969 | −46.0452 | | | | 1223 | 1224 | |
| 135 | 288 | 75 | −56.6965 | −46.0454 | | | | 1226 | 1227 | |
| 136 | 288 | 100 | −56.6953 | −46.0455 | | | | 1231 | 1233 | |
| 137 | 288 | 100 | −56.6935 | −46.0475 | | | | 1240 | 1242 | |
| 138 | 288 | 50 | −56.6923 | −46.0476 | | | | 1245 | 1246 | |
| 139 | 288 | 115 | −56.6912 | −46.0489 | | | | 1250 | 1252 | |
| 140 | 288 | 115 | −56.6898 | −46.0498 | | | | 1255 | 1257 | |
| 141 | 288 | 110 | −56.6884 | −46.0499 | | | | 1302 | 1304 | |
| 142 | 288 | 125 | −56.6877 | −46.0504 | | | | 1308 | 1311 | |
| 143 | 288 | 115 | −56.6869 | −46.0509 | | | | 1314 | 1316 | |
| 144 | 288 | 100 | −56.6866 | −46.0510 | | | | 1319 | 1320 | |
| 145 | 288 | 95 | −56.7496 | −46.5431 | 1700 | | 1700 | 1729 | 1731 | |
| 146 | 289 | 90 | −57.6624 | −49.7934 | 1218 | | 1218 | 1300 | 1302 | |
| 147 | 289 | 90 | −57.6638 | −49.7936 | | | | 1309 | 1311 | |
| 148 | 289 | 75 | −57.6646 | −49.7936 | | | | 1313 | 1315 | |
| 149 | 289 | 75 | −57.6655 | −49.7937 | | | | 1317 | 1319 | |
| 150 | 289 | 125 | −58.2307 | −49.8001 | 1549 | | 1549 | 1624 | 1627 | |
| 151 | 289 | 100 | −58.2307 | −49.8001 | | | | 1631 | 1633 | |
| 152 | 289 | 100 | −58.2313 | −49.8007 | | | | 1642 | 1644 | |

**Table E3.** A summary of the LoCNESS Station Log for AMT-5. All times are in GMT.

| *Cast* | | *Depth* | *Position* | | *Darks* | | *Down Cast* | | *CCD* |
|---|---|---|---|---|---|---|---|---|---|
| *No.* | *SDY* | [m] | *Longitude* | *Latitude* | $E_s$ | $E_d/L_u$ | *Begin* | *End* | *Pic.* |
| 0 | 284 | 75 | −44.8707 | −31.6208 | 1014 | 1230 | 1224 | 1225 | |
| 1 | 285 | 100 | −48.8612 | −35.4852 | 1227 | 1217 | 1302 | 1304 | |
| 2 | 285 | 100 | −48.8610 | −35.4833 | | | 1310 | 1311 | |
| 3 | 285 | 135 | −48.8606 | −35.4813 | | | 1316 | 1318 | |
| 4 | 285 | 100 | −48.8606 | −35.4800 | | | 1322 | 1323 | |
| 5 | 285 | 100 | −48.8611 | −35.4783 | | | 1327 | 1329 | |
| 6 | 285 | 100 | −49.4513 | −36.0912 | 1756 | 1756 | 1806 | 1808 | |
| 7 | 285 | 100 | −49.4553 | −36.0930 | | | 1818 | 1820 | |
| 8 | 285 | 100 | −49.4584 | −36.0941 | | | 1829 | 1831 | |
| 9 | 285 | 100 | −49.4619 | −36.0951 | | | 1843 | 1845 | |
| 10 | 286 | 75 | −51.9172 | −38.8352 | 1154 | 1243 | 1300 | 1301 | |
| 11 | 286 | 105 | −51.9192 | −38.8365 | | | 1309 | 1311 | |
| 12 | 286 | 100 | −51.9202 | −38.8384 | | | 1320 | 1322 | |
| 13 | 286 | 100 | −51.9213 | −38.8401 | | | 1333 | 1335 | |
| 14 | 286 | 100 | −51.9215 | −38.8408 | | | 1338 | 1340 | |
| 15 | 286 | 100 | −52.1344 | −39.1970 | 1615 | 1615 | 1635 | 1637 | |
| 16 | 286 | 100 | −52.1224 | −39.1983 | | | 1652 | 1654 | |
| 17 | 286 | 100 | −52.1174 | −39.1989 | | | 1659 | 1701 | |
| 18 | 286 | 105 | −52.1077 | −39.1994 | | | 1713 | 1715 | |
| 19 | 287 | 100 | −54.4631 | −42.2391 | 1146 | 1146 | 1244 | 1246 | |
| 20 | 287 | 100 | −54.4698 | −42.2403 | | | 1254 | 1256 | |
| 21 | 287 | 100 | −54.4767 | −42.2418 | | | 1305 | 1307 | |
| 22 | 287 | 100 | −54.4840 | −42.2433 | | | 1316 | 1318 | |
| 23 | 287 | 100 | −54.4874 | −42.2438 | | | 1320 | 1322 | |
| 24 | 287 | 100 | −54.4919 | −42.2443 | | | 1325 | 1327 | |
| 25 | 287 | 75 | −54.4969 | −42.2449 | | | 1331 | 1333 | |
| 26 | 287 | 100 | −54.5004 | −42.2454 | | | 1335 | 1337 | 1339 |
| 27 | 287 | 85 | −54.8776 | −42.8228 | 1636 | 1639 | 1757 | 1759 | |
| 28 | 287 | 100 | −54.8783 | −42.8228 | | | 1801 | 1803 | 1339 |
| 29 | 288 | 50 | −56.6980 | −46.0447 | 1136 | 1144 | 1220 | 1221 | |
| 30 | 288 | 75 | −56.6969 | −46.0452 | | | 1223 | 1224 | |
| 31 | 288 | 75 | −56.6965 | −46.0454 | | | 1226 | 1227 | |
| 32 | 288 | 100 | −56.6953 | −46.0455 | | | 1231 | 1233 | |
| 33 | 288 | 100 | −56.6935 | −46.0475 | | | 1240 | 1242 | |
| 34 | 288 | 50 | −56.6923 | −46.0476 | | | 1245 | 1246 | |
| 35 | 288 | 115 | −56.6912 | −46.0489 | | | 1250 | 1252 | |
| 36 | 288 | 115 | −56.6898 | −46.0498 | | | 1255 | 1257 | |
| 37 | 288 | 110 | −56.6884 | −46.0499 | | | 1302 | 1304 | |
| 38 | 288 | 125 | −56.6877 | −46.0504 | | | 1308 | 1311 | |
| 39 | 288 | 115 | −56.6869 | −46.0509 | | | 1314 | 1316 | |
| 40 | 288 | 100 | −56.6866 | −46.0510 | | | 1319 | 1320 | |
| 41 | 288 | 100 | −56.7496 | −46.5431 | 1701 | 1701 | 1729 | 1731 | |
| 42 | 289 | 100 | −57.6624 | −49.7934 | 1224 | 1219 | 1300 | 1302 | |
| 43 | 289 | 100 | −57.6638 | −49.7936 | | | 1309 | 1311 | |
| 44 | 289 | 95 | −57.6646 | −49.7936 | | | 1313 | 1315 | |
| 45 | 289 | 95 | −57.6655 | −49.7937 | | | 1317 | 1319 | |
| 46 | 289 | 140 | −58.2307 | −49.8001 | 1549 | 1549 | 1624 | 1627 | |
| 47 | 289 | 110 | −58.2307 | −49.8001 | | | 1631 | 1633 | |
| 48 | 289 | 115 | −58.2313 | −49.8007 | | | 1642 | 1644 | |
| 49 | 289 | 100 | −58.2314 | −49.8015 | | | 1647 | 1649 | |
| 50 | 289 | 100 | −58.2311 | −49.8044 | | | 1658 | 1700 | |
| 51 | 289 | 100 | −58.2312 | −49.8044 | | | 1705 | 1707 | |
| 52 | 289 | 100 | −58.2314 | −49.8046 | | | 1710 | 1711 | |

**Table F1.** A summary of the Sun Photometer Log for AMT-5. All times are in GMT, $P$ is the atmospheric pressure (mb), $\theta$ is the sun zenith angle (°), and $A$ is the air mass. The activity codes are: `P` for port measurements (`G` is Grimsby, `M` is Madeira, and `S` is Stanley), `S` for on station (the number is the station number), `T` for optics trials, and `U` for underway.

| *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | $\theta$ [°] | *A* | *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | $\theta$ | *A* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PG | 256 | 0853 | 0.730 | 53.570 | | 61.7 | 2.10 | U | 269 | 0950 | −20.765 | 29.215 | 1020.7 | 57.1 | 1.83 |
| PG | 256 | 0931 | 0.730 | 53.570 | | 57.5 | 1.85 | U | 269 | 0951 | −20.768 | 29.212 | 1020.7 | 56.8 | 1.82 |
| PG | 256 | 1222 | 0.730 | 53.570 | | 49.8 | 1.55 | U | 269 | 1018 | −20.849 | 29.145 | 1020.8 | 51.6 | 1.61 |
| PG | 256 | 1244 | 0.730 | 53.570 | | 50.5 | 1.57 | U | 269 | 1019 | −20.855 | 29.140 | 1020.8 | 51.4 | 1.60 |
| U | 257 | 0727 | 1.240 | 53.172 | 1020.5 | 72.8 | 3.35 | U | 269 | 1021 | −20.858 | 29.137 | 1020.8 | 51.1 | 1.59 |
| U | 257 | 0738 | 1.285 | 53.142 | 1020.5 | 71.2 | 3.08 | U | 269 | 1044 | −20.932 | 29.074 | 1021.1 | 46.7 | 1.46 |
| U | 257 | 0755 | 1.354 | 53.094 | 1020.6 | 68.8 | 2.75 | U | 269 | 1045 | −20.935 | 29.072 | 1021.1 | 46.5 | 1.45 |
| U | 257 | 0813 | 1.426 | 53.045 | 1021.0 | 66.4 | 2.48 | U | 269 | 1046 | −20.938 | 29.069 | 1021.1 | 46.3 | 1.45 |
| U | 257 | 0838 | 1.529 | 52.980 | 1021.4 | 63.0 | 2.20 | S11 | 269 | 1100 | −20.968 | 29.047 | 1021.1 | 43.8 | 1.38 |
| U | 257 | 1000 | 1.842 | 52.775 | 1022.2 | 54.0 | 1.70 | S11 | 269 | 1102 | −20.968 | 29.047 | 1021.1 | 43.5 | 1.38 |
| S3 | 261 | 0956 | −13.205 | 47.983 | 1010.9 | 58.7 | 1.92 | S11 | 269 | 1103 | −20.968 | 29.047 | 1021.1 | 43.3 | 1.37 |
| S3 | 261 | 0958 | −13.206 | 47.983 | 1011.0 | 58.4 | 1.90 | S11 | 269 | 1105 | −20.968 | 29.047 | 1021.1 | 43.0 | 1.37 |
| S3 | 261 | 1016 | −13.205 | 47.984 | 1011.0 | 56.1 | 1.79 | S11 | 269 | 1201 | −20.975 | 29.052 | 1021.0 | 34.8 | 1.22 |
| U | 261 | 1319 | −13.675 | 47.875 | 1010.7 | 46.2 | 1.44 | U | 269 | 1206 | −20.978 | 29.049 | 1021.0 | 34.1 | 1.21 |
| U | 261 | 1326 | −13.699 | 47.869 | 1010.6 | 46.5 | 1.45 | U | 269 | 1208 | −20.978 | 29.049 | 1021.0 | 33.9 | 1.20 |
| U | 263 | 1344 | −19.963 | 42.496 | 1021.9 | 41.8 | 1.34 | U | 269 | 1209 | −20.978 | 29.049 | 1021.0 | 33.8 | 1.20 |
| U | 263 | 1347 | −19.964 | 42.487 | 1021.9 | 41.9 | 1.34 | U | 269 | 1301 | −20.984 | 28.853 | 1020.5 | 30.0 | 1.15 |
| U | 263 | 1353 | −19.966 | 42.466 | 1021.9 | 42.1 | 1.35 | U | 269 | 1302 | −20.984 | 28.850 | 1020.5 | 30.0 | 1.15 |
| U | 264 | 0949 | −20.015 | 38.739 | 1021.8 | 59.9 | 1.99 | U | 269 | 1303 | −20.985 | 28.840 | 1020.5 | 30.0 | 1.15 |
| S7 | 264 | 1003 | −20.011 | 38.716 | 1021.9 | 57.5 | 1.86 | U | 269 | 1327 | −20.989 | 28.749 | 1020.2 | 29.9 | 1.15 |
| S7 | 264 | 1023 | −20.011 | 38.717 | 1021.9 | 54.2 | 1.70 | U | 269 | 1328 | −20.989 | 28.746 | 1020.2 | 30.0 | 1.15 |
| S7 | 264 | 1024 | −20.011 | 38.717 | 1021.9 | 54.0 | 1.70 | U | 269 | 1330 | −20.989 | 28.738 | 1020.2 | 30.0 | 1.15 |
| S7 | 264 | 1026 | −20.011 | 38.717 | 1021.9 | 53.7 | 1.69 | S12 | 269 | 1406 | −20.993 | 28.634 | 1019.8 | 32.2 | 1.18 |
| S7 | 264 | 1034 | −20.013 | 38.717 | 1021.9 | 52.4 | 1.64 | S12 | 269 | 1411 | −20.993 | 28.634 | 1019.8 | 32.7 | 1.19 |
| S7 | 264 | 1042 | −20.013 | 38.717 | 1021.9 | 51.2 | 1.59 | S12 | 269 | 1412 | −20.993 | 28.634 | 1019.8 | 32.8 | 1.19 |
| S7 | 264 | 1101 | −20.013 | 38.721 | 1022.0 | 48.3 | 1.50 | S12 | 269 | 1414 | −20.993 | 28.634 | 1019.8 | 33.0 | 1.19 |
| S7 | 264 | 1103 | −20.013 | 38.721 | 1022.0 | 48.1 | 1.49 | S12 | 269 | 1420 | −20.993 | 28.634 | 1019.8 | 33.6 | 1.20 |
| S7 | 264 | 1104 | −20.013 | 38.721 | 1022.0 | 47.9 | 1.49 | S12 | 269 | 1421 | −20.993 | 28.634 | 1019.8 | 33.8 | 1.20 |
| U | 265 | 1605 | −18.962 | 34.819 | 1017.8 | 53.7 | 1.68 | S12 | 269 | 1444 | −20.994 | 28.631 | 1019.6 | 36.7 | 1.25 |
| U | 265 | 1607 | −18.960 | 34.816 | 1017.8 | 54.1 | 1.70 | S12 | 269 | 1445 | −20.994 | 28.628 | 1019.6 | 36.8 | 1.25 |
| U | 265 | 1608 | −18.955 | 34.819 | 1017.8 | 54.3 | 1.71 | S12 | 269 | 1446 | −20.994 | 28.624 | 1019.6 | 37.0 | 1.25 |
| U | 265 | 1613 | −18.944 | 34.795 | 1017.8 | 55.2 | 1.75 | U | 269 | 1521 | −21.001 | 28.492 | 1019.3 | 42.1 | 1.35 |
| U | 265 | 1615 | −18.939 | 34.788 | 1017.7 | 55.5 | 1.76 | U | 269 | 1522 | −21.001 | 28.488 | 1019.3 | 42.3 | 1.35 |
| U | 265 | 1616 | −18.937 | 34.785 | 1017.7 | 55.8 | 1.77 | U | 269 | 1603 | −21.003 | 28.327 | 1019.2 | 49.8 | 1.54 |
| PM | 267 | 1156 | −17.065 | 32.250 | 1018.7 | 35.8 | 1.23 | U | 269 | 1637 | −21.000 | 28.202 | 1019.1 | 56.4 | 1.80 |
| PM | 267 | 1157 | −17.065 | 32.250 | 1018.7 | 35.7 | 1.23 | U | 269 | 1638 | −21.000 | 28.198 | 1019.1 | 56.6 | 1.81 |
| PM | 267 | 1158 | −17.065 | 32.250 | 1018.7 | 35.6 | 1.23 | U | 269 | 1639 | −21.000 | 28.190 | 1019.1 | 56.9 | 1.82 |
| PM | 267 | 1200 | −17.065 | 32.250 | 1018.7 | 35.5 | 1.19 | U | 269 | 1641 | −21.000 | 28.183 | 1019.1 | 57.2 | 1.84 |
| PM | 267 | 1201 | −17.065 | 32.250 | 1018.7 | 35.3 | 1.22 | U | 269 | 1710 | −20.995 | 28.071 | 1019.1 | 63.6 | 2.23 |
| PM | 267 | 1609 | −17.006 | 32.519 | 1017.3 | 55.3 | 1.75 | U | 269 | 1719 | −20.995 | 28.038 | 1019.0 | 65.5 | 2.39 |
| PM | 267 | 1611 | −17.006 | 32.519 | 1017.3 | 55.6 | 1.77 | U | 269 | 1730 | −20.994 | 27.998 | 1019.0 | 67.8 | 2.63 |
| PM | 267 | 1613 | −17.006 | 32.519 | 1017.3 | 55.9 | 1.78 | U | 269 | 1740 | −20.993 | 27.963 | 1019.1 | 69.9 | 2.89 |
| U | 268 | 1208 | −17.090 | 32.444 | 1019.8 | 35.2 | 1.22 | U | 269 | 1750 | −20.992 | 27.927 | 1019.0 | 72.2 | 3.23 |
| U | 268 | 1210 | −17.097 | 32.439 | 1019.8 | 35.1 | 1.22 | U | 269 | 1758 | −20.991 | 27.898 | 1019.0 | 73.9 | 3.56 |
| U | 268 | 1211 | −17.100 | 32.437 | 1019.8 | 35.0 | 1.22 | U | 270 | 0920 | −20.992 | 24.489 | 1018.1 | 62.1 | 2.13 |
| U | 268 | 1314 | −17.239 | 32.312 | 1019.8 | 33.1 | 1.19 | U | 270 | 0921 | −20.992 | 24.485 | 1018.1 | 61.9 | 2.11 |
| U | 268 | 1315 | −17.238 | 32.312 | 1019.8 | 33.1 | 1.19 | U | 270 | 0922 | −20.993 | 24.481 | 1018.1 | 61.7 | 2.10 |
| U | 268 | 1316 | −17.236 | 32.311 | 1019.8 | 33.1 | 1.19 | U | 270 | 0933 | −20.993 | 24.435 | 1018.1 | 59.2 | 1.95 |
| U | 268 | 1630 | −17.558 | 32.019 | 1019.3 | 59.1 | 1.94 | U | 270 | 0959 | −20.995 | 24.341 | 1018.2 | 53.7 | 1.68 |
| U | 269 | 0920 | −20.674 | 29.292 | 1020.5 | 63.2 | 2.21 | U | 270 | 1016 | −20.995 | 24.274 | 1018.2 | 50.0 | 1.55 |
| U | 269 | 0921 | −20.677 | 29.290 | 1020.5 | 63.0 | 2.19 | U | 270 | 1018 | −20.995 | 24.270 | 1018.2 | 49.6 | 1.54 |
| U | 269 | 0922 | −20.679 | 29.287 | 1020.5 | 62.8 | 2.18 | U | 270 | 1041 | −20.996 | 24.183 | 1018.2 | 45.0 | 1.41 |
| U | 269 | 0949 | −20.759 | 29.220 | 1020.7 | 57.3 | 1.85 | U | 270 | 1059 | −20.998 | 24.135 | 1018.1 | 41.4 | 1.33 |

**Table F1. (cont.)** A summary of the Sun Photometer Log for AMT-5. All times are in GMT.

| *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* | *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S13 | 270 | 1100 | −20.998 | 24.135 | 1018.1 | 41.2 | 1.33 | T | 272 | 1059 | −20.010 | 15.493 | 1015.0 | 36.9 | 1.25 |
| S13 | 270 | 1102 | −20.998 | 24.135 | 1018.1 | 40.9 | 1.32 | T | 272 | 1101 | −20.010 | 15.493 | 1015.0 | 36.6 | 1.24 |
| S13 | 270 | 1129 | −20.999 | 24.139 | 1018.1 | 35.9 | 1.23 | T | 272 | 1104 | −20.010 | 15.492 | 1015.0 | 35.9 | 1.23 |
| S13 | 270 | 1149 | −21.000 | 24.141 | 1018.1 | 33.0 | 1.19 | U | 272 | 1222 | −20.014 | 15.346 | 1014.3 | 21.3 | 1.07 |
| S13 | 270 | 1150 | −21.000 | 24.141 | 1018.1 | 32.8 | 1.19 | U | 272 | 1224 | −20.014 | 15.335 | 1014.2 | 21.0 | 1.07 |
| S13 | 270 | 1152 | −21.000 | 24.141 | 1018.1 | 32.5 | 1.19 | U | 272 | 1225 | −20.014 | 15.325 | 1014.1 | 20.8 | 1.07 |
| U | 270 | 1221 | −21.002 | 24.057 | 1017.8 | 28.6 | 1.14 | S21 | 275 | 1721 | −24.453 | 2.075 | 1010.5 | 58.9 | 1.93 |
| U | 270 | 1223 | −21.002 | 24.054 | 1017.8 | 28.4 | 1.14 | S21 | 275 | 1722 | −24.453 | 2.075 | 1010.5 | 59.2 | 1.94 |
| U | 270 | 1225 | −21.002 | 24.047 | 1017.8 | 28.2 | 1.13 | S21 | 275 | 1723 | −24.453 | 2.075 | 1010.5 | 59.4 | 1.96 |
| U | 270 | 1314 | −21.007 | 23.873 | 1017.1 | 25.3 | 1.10 | S21 | 275 | 1727 | −24.452 | 2.074 | 1010.5 | 60.3 | 2.01 |
| U | 270 | 1315 | −21.008 | 23.869 | 1017.1 | 25.3 | 1.10 | S21 | 275 | 1728 | −24.452 | 2.074 | 1010.5 | 60.6 | 2.03 |
| U | 270 | 1317 | −21.008 | 23.862 | 1017.1 | 25.3 | 1.10 | S21 | 275 | 1729 | −24.451 | 2.073 | 1010.5 | 60.9 | 2.05 |
| U | 270 | 1338 | −21.011 | 23.784 | 1016.8 | 25.8 | 1.11 | S21 | 275 | 1732 | −24.450 | 2.073 | 1010.5 | 61.7 | 2.10 |
| U | 270 | 1340 | −21.011 | 23.780 | 1016.8 | 25.9 | 1.11 | S21 | 275 | 1734 | −24.451 | 2.072 | 1010.4 | 62.2 | 2.13 |
| U | 270 | 1341 | −21.012 | 23.773 | 1016.8 | 26.0 | 1.11 | S21 | 275 | 1741 | −24.448 | 2.071 | 1010.4 | 63.8 | 2.25 |
| S14 | 270 | 1413 | −21.009 | 23.726 | 1016.4 | 28.8 | 1.14 | S21 | 275 | 1748 | −24.446 | 2.068 | 1010.4 | 65.6 | 2.41 |
| S14 | 270 | 1426 | −21.008 | 23.726 | 1016.3 | 30.5 | 1.16 | U | 276 | 0912 | −25.575 | −0.553 | 1011.2 | 64.6 | 2.32 |
| S14 | 270 | 1431 | −21.008 | 23.726 | 1016.3 | 31.2 | 1.17 | U | 276 | 0914 | −25.576 | −0.557 | 1011.4 | 64.1 | 2.28 |
| U | 270 | 1520 | −21.006 | 23.583 | 1015.9 | 39.3 | 1.29 | U | 276 | 0915 | −25.578 | −0.563 | 1011.4 | 63.8 | 2.26 |
| U | 270 | 1521 | −21.006 | 23.580 | 1015.9 | 39.5 | 1.29 | U | 276 | 0926 | −25.592 | −0.597 | 1011.4 | 61.1 | 2.06 |
| U | 270 | 1522 | −21.006 | 23.576 | 1015.9 | 39.8 | 1.30 | U | 276 | 0937 | −25.604 | −0.628 | 1011.5 | 58.4 | 1.90 |
| U | 270 | 1548 | −21.007 | 23.484 | 1015.7 | 44.7 | 1.40 | U | 276 | 1003 | −25.636 | −0.709 | 1011.8 | 52.0 | 1.62 |
| U | 270 | 1549 | −21.007 | 23.477 | 1015.7 | 45.0 | 1.41 | U | 276 | 1004 | −25.639 | −0.715 | 1011.8 | 51.6 | 1.61 |
| U | 270 | 1551 | −21.007 | 23.473 | 1015.7 | 45.3 | 1.42 | U | 276 | 1006 | −25.640 | −0.718 | 1011.8 | 51.2 | 1.59 |
| U | 270 | 1631 | −21.005 | 23.332 | 1015.3 | 53.6 | 1.68 | S22 | 276 | 1029 | −25.664 | −0.773 | 1012.0 | 45.4 | 1.42 |
| U | 270 | 1632 | −21.005 | 23.328 | 1015.3 | 53.9 | 1.69 | S22 | 276 | 1031 | −25.665 | −0.773 | 1012.0 | 45.0 | 1.41 |
| U | 270 | 1634 | −21.004 | 23.322 | 1015.3 | 54.3 | 1.71 | S22 | 276 | 1046 | −25.663 | −0.774 | 1012.4 | 41.2 | 1.33 |
| U | 270 | 1652 | −21.005 | 23.259 | 1015.2 | 58.3 | 1.89 | S22 | 276 | 1054 | −25.662 | −0.773 | 1012.4 | 39.2 | 1.29 |
| U | 270 | 1653 | −21.005 | 23.255 | 1015.2 | 58.5 | 1.91 | S22 | 276 | 1107 | −25.663 | −0.773 | 1012.6 | 36.0 | 1.23 |
| U | 270 | 1726 | −21.003 | 23.138 | 1015.2 | 65.8 | 2.42 | S22 | 276 | 1147 | −25.666 | −0.769 | 1012.8 | 26.0 | 1.11 |
| U | 271 | 0959 | −20.563 | 19.890 | 1016.0 | 52.0 | 1.62 | S22 | 276 | 1149 | −25.666 | −0.769 | 1012.8 | 25.6 | 1.11 |
| U | 271 | 1001 | −20.562 | 19.886 | 1016.0 | 51.6 | 1.61 | S22 | 276 | 1159 | −25.664 | −0.771 | 1012.8 | 23.1 | 1.09 |
| U | 271 | 1003 | −20.561 | 19.880 | 1016.0 | 51.2 | 1.59 | S22 | 276 | 1202 | −25.664 | −0.771 | 1012.8 | 22.4 | 1.08 |
| U | 271 | 1033 | −20.541 | 19.779 | 1016.0 | 44.5 | 1.40 | S22 | 276 | 1205 | −25.664 | −0.771 | 1012.8 | 21.6 | 1.07 |
| U | 271 | 1035 | −20.541 | 19.775 | 1016.0 | 44.1 | 1.39 | U | 276 | 1224 | −25.665 | −0.770 | 1012.8 | 16.8 | 1.04 |
| U | 271 | 1037 | −20.539 | 19.769 | 1016.0 | 43.7 | 1.38 | U | 276 | 1226 | −25.665 | −0.770 | 1012.8 | 16.3 | 1.04 |
| S15 | 271 | 1112 | −20.528 | 19.721 | 1016.2 | 36.4 | 1.24 | U | 276 | 1228 | −25.666 | −0.769 | 1012.8 | 16.0 | 1.04 |
| S15 | 271 | 1117 | −20.529 | 19.722 | 1016.2 | 35.5 | 1.23 | S23 | 276 | 1618 | −25.894 | −1.359 | 1010.7 | 41.8 | 1.34 |
| S15 | 271 | 1120 | −20.529 | 19.723 | 1016.2 | 34.9 | 1.22 | S23 | 276 | 1632 | −25.893 | −1.358 | 1010.7 | 45.2 | 1.42 |
| S15 | 271 | 1135 | −20.530 | 19.727 | 1016.0 | 32.1 | 1.18 | S23 | 276 | 1639 | −25.891 | −1.359 | 1010.7 | 47.0 | 1.46 |
| S15 | 271 | 1136 | −20.530 | 19.727 | 1016.0 | 31.8 | 1.18 | S23 | 276 | 1651 | −25.887 | −1.360 | 1010.7 | 50.0 | 1.55 |
| S15 | 271 | 1138 | −20.531 | 19.728 | 1016.0 | 31.5 | 1.17 | U | 276 | 1710 | −25.908 | −1.406 | 1010.5 | 54.7 | 1.72 |
| S15 | 271 | 1147 | −20.531 | 19.730 | 1015.9 | 30.0 | 1.15 | U | 276 | 1711 | −25.909 | −1.409 | 1010.5 | 55.0 | 1.74 |
| S15 | 271 | 1158 | −20.532 | 19.734 | 1015.9 | 28.1 | 1.13 | U | 276 | 1713 | −25.911 | −1.415 | 1010.4 | 55.4 | 1.75 |
| U | 271 | 1208 | −20.531 | 19.736 | 1015.9 | 26.6 | 1.12 | U | 277 | 0932 | −27.209 | −4.408 | 1015.0 | 61.1 | 2.06 |
| U | 271 | 1221 | −20.518 | 19.719 | 1015.9 | 24.9 | 1.10 | U | 277 | 0933 | −27.212 | −4.414 | 1015.0 | 60.8 | 2.05 |
| U | 271 | 1244 | −20.509 | 19.655 | 1015.9 | 22.5 | 1.08 | U | 277 | 0934 | −27.213 | −4.418 | 1015.0 | 60.6 | 2.03 |
| U | 271 | 1259 | −20.501 | 19.612 | 1015.9 | 21.6 | 1.08 | U | 277 | 0954 | −27.240 | −4.485 | 1015.3 | 55.6 | 1.76 |
| U | 271 | 1317 | −20.493 | 19.560 | 1015.9 | 21.4 | 1.07 | U | 277 | 0956 | −27.242 | −4.488 | 1015.3 | 55.2 | 1.75 |
| U | 271 | 1353 | −20.475 | 19.448 | 1015.9 | 23.6 | 1.09 | U | 277 | 0957 | −27.243 | −4.491 | 1015.3 | 54.9 | 1.74 |
| U | 271 | 1424 | −20.460 | 19.352 | 1015.9 | 27.6 | 1.13 | U | 277 | 1056 | −27.323 | −4.691 | 1015.5 | 40.2 | 1.31 |
| U | 272 | 1043 | −20.012 | 15.527 | 1015.0 | 40.5 | 1.31 | U | 277 | 1107 | −27.336 | −4.724 | 1015.6 | 37.5 | 1.26 |
| U | 272 | 1044 | −20.012 | 15.524 | 1015.0 | 40.3 | 1.31 | U | 277 | 1108 | −27.339 | −4.731 | 1015.6 | 37.2 | 1.25 |
| U | 272 | 1046 | −20.012 | 15.520 | 1014.9 | 39.9 | 1.30 | U | 277 | 1110 | −27.340 | −4.734 | 1015.6 | 36.8 | 1.25 |

**Table F1. (cont.)** A summary of the Sun Photometer Log for AMT-5. All times are in GMT.

| *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* | *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S24 | 277 | 1130 | −27.365 | −4.784 | 1015.5 | 31.8 | 1.18 | S28 | 279 | 1253 PM | −30.701 | −12.882 | 1016.8 | 16.1 | 1.04 |
| S24 | 277 | 1131 | −27.366 | −4.784 | 1015.5 | 31.5 | 1.17 | S28 | 279 | 1306 | −30.700 | −12.883 | 1016.6 | 13.4 | 1.03 |
| S24 | 277 | 1133 | −27.367 | −4.784 | 1015.5 | 31.0 | 1.17 | S28 | 279 | 1308 | −30.700 | −12.884 | 1016.6 | 13.0 | 1.03 |
| S24 | 277 | 1159 | −27.371 | −4.785 | 1015.5 | 24.6 | 1.10 | S28 | 279 | 1315 | −30.699 | −12.884 | 1016.7 | 11.6 | 1.02 |
| S24 | 277 | 1200 | −27.371 | −4.785 | 1015.5 | 24.3 | 1.10 | U | 279 | 1433 | −30.758 | −13.058 | 1015.6 | 13.4 | 1.03 |
| S24 | 277 | 1201 | −27.371 | −4.785 | 1015.5 | 24.0 | 1.09 | U | 279 | 1434 | −30.761 | −13.064 | 1015.6 | 13.7 | 1.03 |
| S24 | 277 | 1217 | −27.373 | −4.785 | 1015.4 | 20.1 | 1.06 | U | 279 | 1512 | −30.811 | −13.168 | 1015.1 | 21.9 | 1.08 |
| S24 | 277 | 1218 | −27.373 | −4.785 | 1015.5 | 19.8 | 1.06 | U | 279 | 1514 | −30.814 | −13.173 | 1015.2 | 22.3 | 1.08 |
| S24 | 277 | 1225 | −27.375 | −4.785 | 1015.5 | 18.1 | 1.05 | U | 279 | 1516 | −30.816 | −13.179 | 1015.1 | 22.7 | 1.08 |
| S24 | 277 | 1252 | −27.380 | −4.785 | 1014.8 | 11.3 | 1.02 | U | 280 | 1244 | −32.371 | −16.729 | 1017.6 | 21.2 | 1.07 |
| S24 | 277 | 1254 | −27.380 | −4.785 | 1014.8 | 10.9 | 1.02 | U | 280 | 1245 | −32.374 | −16.734 | 1017.6 | 20.9 | 1.07 |
| S24 | 277 | 1255 | −27.381 | −4.785 | 1014.8 | 10.6 | 1.02 | U | 280 | 1252 | −32.382 | −16.752 | 1017.5 | 19.5 | 1.06 |
| S24 | 277 | 1315 | −27.384 | −4.786 | 1014.6 | 5.7 | 1.00 | U | 280 | 1322 | −32.421 | −16.841 | 1017.7 | 14.3 | 1.03 |
| S24 | 277 | 1317 | −27.385 | −4.786 | 1014.6 | 5.1 | 1.00 | U | 280 | 1324 | −32.424 | −16.847 | 1017.7 | 14.1 | 1.03 |
| S24 | 277 | 1319 | −27.385 | −4.786 | 1014.6 | 4.7 | 1.00 | U | 280 | 1421 | −32.495 | −17.018 | 1017.4 | 13.1 | 1.03 |
| U | 277 | 1431 | −27.480 | −5.011 | 1013.6 | 13.4 | 1.03 | U | 280 | 1423 | −32.497 | −17.024 | 1017.5 | 13.3 | 1.03 |
| U | 277 | 1433 | −27.482 | −5.014 | 1013.6 | 13.8 | 1.03 | U | 280 | 1425 | −32.500 | −17.031 | 1017.5 | 13.5 | 1.03 |
| U | 277 | 1434 | −27.485 | −5.021 | 1013.6 | 14.1 | 1.03 | S30 | 280 | 1506 | −32.546 | −17.144 | 1016.9 | 20.7 | 1.07 |
| U | 277 | 1506 | −27.529 | −5.131 | 1013.4 | 22.0 | 1.08 | S30 | 280 | 1525 | −32.546 | −17.148 | 1016.8 | 24.6 | 1.10 |
| U | 277 | 1507 | −27.530 | −5.134 | 1013.4 | 22.3 | 1.08 | S30 | 280 | 1527 | −32.546 | −17.148 | 1016.8 | 25.0 | 1.10 |
| U | 277 | 1511 | −27.534 | −5.144 | 1013.4 | 23.2 | 1.09 | S30 | 280 | 1529 | −32.546 | −17.148 | 1016.7 | 25.4 | 1.11 |
| U | 277 | 1546 | −27.581 | −5.265 | 1012.9 | 31.9 | 1.18 | S30 | 280 | 1536 | −32.545 | −17.148 | 1016.7 | 26.9 | 1.12 |
| U | 277 | 1554 | −27.591 | −5.289 | 1012.8 | 33.8 | 1.20 | S30 | 280 | 1548 | −32.545 | −17.149 | 1016.6 | 29.6 | 1.15 |
| S25 | 277 | 1632 | −27.601 | −5.314 | 1012.6 | 43.4 | 1.37 | S30 | 280 | 1555 | −32.544 | −17.150 | 1016.5 | 31.3 | 1.17 |
| S25 | 277 | 1634 | −27.601 | −5.314 | 1012.6 | 43.9 | 1.38 | U | 280 | 1634 | −32.560 | −17.226 | 1016.1 | 40.1 | 1.31 |
| U | 277 | 1652 | −27.610 | −5.337 | 1012.5 | 48.3 | 1.50 | U | 280 | 1649 | −32.577 | −17.276 | 1015.9 | 43.7 | 1.38 |
| U | 277 | 1654 | −27.613 | −5.343 | 1012.5 | 48.9 | 1.52 | U | 280 | 1722 | −32.613 | −17.371 | 1015.7 | 51.4 | 1.60 |
| U | 277 | 1727 | −27.656 | −5.446 | 1012.3 | 57.0 | 1.83 | U | 280 | 1739 | −32.634 | −17.422 | 1015.6 | 55.5 | 1.76 |
| U | 277 | 1728 | −27.660 | −5.456 | 1012.3 | 57.3 | 1.84 | U | 280 | 1741 | −32.636 | −17.428 | 1015.6 | 56.0 | 1.78 |
| U | 277 | 1750 | −27.692 | −5.530 | 1012.2 | 62.8 | 2.17 | U | 280 | 1751 | −32.649 | −17.458 | 1015.7 | 58.3 | 1.90 |
| U | 278 | 0932 | −28.970 | −8.606 | 1014.6 | 62.3 | 2.14 | U | 280 | 1753 | −32.651 | −17.464 | 1015.7 | 58.8 | 1.92 |
| U | 278 | 0934 | −28.972 | −8.613 | 1014.7 | 61.9 | 2.11 | U | 280 | 1803 | −32.664 | −17.494 | 1015.8 | 61.1 | 2.06 |
| U | 278 | 0935 | −28.975 | −8.618 | 1014.7 | 61.6 | 2.09 | U | 280 | 1809 | −32.671 | −17.512 | 1015.9 | 62.6 | 2.16 |
| U | 278 | 0946 | −28.989 | −8.650 | 1014.9 | 58.9 | 1.93 | U | 280 | 1818 | −32.682 | −17.534 | 1016.0 | 64.8 | 2.33 |
| U | 278 | 0959 | −29.008 | −8.694 | 1015.2 | 56.0 | 1.78 | U | 281 | 1054 | −34.169 | −20.580 | 1020.2 | 48.3 | 1.50 |
| U | 278 | 1109 | −29.095 | −8.913 | 1015.6 | 38.9 | 1.28 | U | 281 | 1111 | −34.201 | −20.628 | 1020.3 | 44.5 | 1.40 |
| U | 278 | 1112 | −29.099 | −8.922 | 1015.6 | 38.1 | 1.27 | U | 281 | 1115 | −34.211 | −20.643 | 1020.3 | 43.5 | 1.38 |
| U | 278 | 1117 | −29.105 | −8.938 | 1015.6 | 36.9 | 1.25 | U | 281 | 1117 | −34.215 | −20.649 | 1020.4 | 43.1 | 1.37 |
| U | 278 | 1118 | −29.107 | −8.945 | 1015.6 | 36.6 | 1.24 | U | 281 | 1119 | −34.218 | −20.655 | 1020.4 | 42.6 | 1.36 |
| S26 | 278 | 1133 | −29.115 | −8.966 | 1015.8 | 32.9 | 1.19 | S31 | 281 | 1130 | −34.224 | −20.663 | 1020.7 | 40.2 | 1.31 |
| S26 | 278 | 1135 | −29.116 | −8.966 | 1015.7 | 32.4 | 1.18 | S31 | 281 | 1132 | −34.224 | −20.663 | 1020.7 | 39.8 | 1.30 |
| S26 | 278 | 1137 | −29.116 | −8.966 | 1015.7 | 32.0 | 1.18 | S31 | 281 | 1133 | −34.225 | −20.663 | 1020.7 | 39.5 | 1.29 |
| S26 | 278 | 1156 | −29.116 | −8.967 | 1015.5 | 27.4 | 1.13 | S31 | 281 | 1143 | −34.225 | −20.662 | 1020.8 | 37.2 | 1.25 |
| S26 | 278 | 1158 | −29.116 | −8.967 | 1015.5 | 26.7 | 1.12 | S31 | 281 | 1153 | −34.225 | −20.661 | 1020.7 | 35.1 | 1.22 |
| S26 | 278 | 1216 | −29.114 | −8.970 | 1015.4 | 22.4 | 1.08 | S31 | 281 | 1204 | −34.225 | −20.662 | 1020.8 | 32.8 | 1.19 |
| S26 | 278 | 1243 | −29.114 | −8.965 | 1015.1 | 15.9 | 1.04 | S31 | 281 | 1213 | −34.225 | −20.662 | 1020.8 | 30.8 | 1.16 |
| S26 | 278 | 1306 | −29.113 | −8.963 | 1015.0 | 10.5 | 1.02 | S31 | 281 | 1224 | −34.224 | −20.663 | 1020.7 | 28.5 | 1.14 |
| S26 | 278 | 1307 | −29.113 | −8.962 | 1014.9 | 10.3 | 1.02 | S31 | 281 | 1235 | −34.225 | −20.664 | 1020.6 | 26.2 | 1.11 |
| U | 278 | 1557 | −29.289 | −9.421 | 1013.8 | 33.1 | 1.19 | S31 | 281 | 1245 | −34.224 | −20.666 | 1020.6 | 24.3 | 1.10 |
| U | 278 | 1558 | −29.292 | −9.427 | 1013.7 | 33.4 | 1.20 | S31 | 281 | 1256 | −34.224 | −20.667 | 1020.5 | 22.3 | 1.08 |
| U | 278 | 1600 | −29.293 | −9.430 | 1013.8 | 33.8 | 1.38 | S31 | 281 | 1307 | −34.225 | −20.668 | 1020.5 | 20.3 | 1.07 |
| S28 | 279 | 1246 | −30.701 | −12.881 | 1016.9 | 17.6 | 1.05 | S31 | 281 | 1318 | −34.225 | −20.670 | 1020.4 | 18.6 | 1.05 |
| S28 | 279 | 1251 | −30.701 | −12.882 | 1016.8 | 16.5 | 1.04 | S31 | 281 | 1331 | −34.225 | −20.671 | 1020.3 | 17 | 1.04 |

**Table F1. (cont.)** A summary of the Sun Photometer Log for AMT-5. All times are in GMT.

| *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* | *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S31 | 281 | 1341 | −34.227 | −20.672 | 1020.3 | 16.0 | 1.04 | S41 | 287 | 1723 | −54.869 | −42.811 | 1015.0 | 43.5 | 1.38 |
| U | 281 | 1349 | −34.228 | −20.673 | 1020.2 | 15.4 | 1.04 | S41 | 287 | 1728 | −54.869 | −42.813 | 1014.9 | 44.2 | 1.39 |
| U | 281 | 1624 | −34.536 | −21.058 | 1019.4 | 37.0 | 1.25 | S41 | 287 | 1729 | −54.870 | −42.813 | 1014.9 | 44.3 | 1.40 |
| U | 281 | 1629 | −34.549 | −21.072 | 1019.4 | 38.2 | 1.27 | S41 | 287 | 1730 | −54.870 | −42.814 | 1014.8 | 44.5 | 1.40 |
| U | 281 | 1631 | −34.550 | −21.074 | 1019.3 | 38.6 | 1.28 | S41 | 287 | 1734 | −54.871 | −42.815 | 1014.6 | 45.0 | 1.41 |
| U | 281 | 1632 | −34.552 | −21.076 | 1019.3 | 38.8 | 1.28 | S41 | 287 | 1736 | −54.871 | −42.816 | 1014.5 | 45.3 | 1.42 |
| U | 282 | 0934 | −36.983 | −23.594 | 1023.3 | 69.1 | 2.79 | S41 | 287 | 1737 | −54.872 | −42.816 | 1014.5 | 45.5 | 1.42 |
| U | 282 | 1024 | −37.109 | −23.725 | 1023.9 | 58.2 | 1.89 | U | 288 | 1121 | −56.690 | −45.936 | 1013.4 | 65.0 | 2.36 |
| U | 282 | 1026 | −37.114 | −23.730 | 1024.0 | 57.7 | 1.87 | U | 288 | 1125 | −56.692 | −45.945 | 1013.4 | 64.4 | 2.30 |
| U | 282 | 1028 | −37.119 | −23.735 | 1024.0 | 57.3 | 1.85 | U | 288 | 1126 | −56.692 | −45.948 | 1013.4 | 64.2 | 2.29 |
| U | 282 | 1033 | −37.129 | −23.746 | 1024.0 | 56.2 | 1.79 | U | 288 | 1132 | −56.693 | −45.965 | 1013.4 | 63.2 | 2.21 |
| U | 283 | 1329 | −41.184 | −27.884 | 1018.2 | 26.0 | 1.11 | S42 | 288 | 1209 | −56.700 | −46.044 | 1014.0 | 57.3 | 1.84 |
| U | 283 | 1331 | −41.190 | −27.890 | 1018.1 | 25.8 | 1.11 | S42 | 288 | 1214 | −56.699 | −46.044 | 1014.0 | 56.5 | 1.81 |
| U | 283 | 1332 | −41.193 | −27.893 | 1018.0 | 25.6 | 1.11 | S42 | 288 | 1222 | −56.697 | −46.045 | 1014.0 | 55.2 | 1.75 |
| U | 283 | 1338 | −41.212 | −27.910 | 1017.9 | 24.9 | 1.10 | S42 | 288 | 1241 | −56.693 | −46.048 | 1014.0 | 52.4 | 1.64 |
| U | 283 | 1343 | −41.230 | −27.927 | 1017.9 | 24.3 | 1.10 | S42 | 288 | 1243 | −56.693 | −46.048 | 1014.0 | 52.1 | 1.63 |
| U | 286 | 0952 | −51.659 | −38.510 | 1021.5 | 77.4 | 4.48 | S42 | 288 | 1245 | −56.692 | −46.048 | 1014.0 | 51.8 | 1.61 |
| U | 286 | 0953 | −51.661 | −38.513 | 1021.5 | 77.2 | 4.42 | S42 | 288 | 1253 | −56.690 | −46.049 | 1014.0 | 50.7 | 1.58 |
| U | 286 | 1011 | −51.702 | −38.564 | 1021.7 | 73.7 | 3.51 | S42 | 288 | 1332 | −56.689 | −46.049 | 1014.2 | 45.6 | 1.43 |
| U | 286 | 1013 | −51.702 | −38.564 | 1021.7 | 73.3 | 3.44 | S42 | 288 | 1333 | −56.689 | −46.048 | 1014.1 | 45.4 | 1.42 |
| U | 286 | 1018 | −51.720 | −38.587 | 1021.8 | 72.3 | 3.26 | S42 | 288 | 1335 | −56.689 | −46.048 | 1014.1 | 45.2 | 1.42 |
| U | 286 | 1020 | −51.723 | −38.590 | 1021.8 | 72.0 | 3.20 | S42 | 288 | 1351 | −56.687 | −46.046 | 1014.1 | 43.4 | 1.37 |
| U | 286 | 1021 | −51.727 | −38.595 | 1021.9 | 71.7 | 3.16 | S42 | 288 | 1405 | −56.687 | −46.044 | 1014.2 | 42.0 | 1.34 |
| U | 286 | 1041 | −51.766 | −38.646 | 1022.3 | 67.9 | 2.64 | S42 | 288 | 1411 | −56.686 | −46.045 | 1014.2 | 41.5 | 1.33 |
| U | 286 | 1042 | −51.768 | −38.649 | 1022.3 | 67.7 | 2.62 | S42 | 288 | 1413 | −56.686 | −46.044 | 1014.2 | 41.3 | 1.33 |
| U | 286 | 1051 | −51.787 | −38.674 | 1022.5 | 66.0 | 2.45 | S42 | 288 | 1414 | −56.686 | −46.043 | 1014.2 | 41.2 | 1.33 |
| U | 286 | 1053 | −51.788 | −38.676 | 1022.5 | 65.6 | 2.41 | U | 288 | 1425 | −56.692 | −46.044 | 1014.0 | 40.3 | 1.31 |
| U | 286 | 1054 | −51.791 | −38.679 | 1022.5 | 65.4 | 2.39 | U | 288 | 1514 | −56.705 | −46.196 | 1014.6 | 38.0 | 1.27 |
| U | 286 | 1104 | −51.809 | −38.703 | 1022.5 | 63.5 | 2.23 | U | 288 | 1525 | −56.707 | −46.228 | 1014.6 | 37.9 | 1.27 |
| U | 286 | 1106 | −51.811 | −38.706 | 1022.5 | 63.1 | 2.20 | U | 288 | 1600 | −56.722 | −46.343 | 1014.8 | 38.5 | 1.28 |
| U | 286 | 1126 | −51.851 | −38.760 | 1022.6 | 59.4 | 1.96 | U | 288 | 1601 | −56.723 | −46.350 | 1014.9 | 38.5 | 1.28 |
| U | 286 | 1128 | −51.857 | −38.769 | 1022.6 | 59.0 | 1.94 | U | 288 | 1603 | −56.723 | −46.353 | 1014.8 | 38.6 | 1.28 |
| U | 286 | 1147 | −51.896 | −38.823 | 1022.6 | 55.5 | 1.76 | U | 288 | 1647 | −56.745 | −46.500 | 1015.3 | 41.5 | 1.33 |
| U | 286 | 1149 | −51.901 | −38.828 | 1022.6 | 55.2 | 1.75 | U | 288 | 1654 | −56.749 | −46.520 | 1015.2 | 42.1 | 1.34 |
| S38 | 286 | 1200 | −51.910 | −38.838 | 1023.1 | 53.2 | 1.45 | U | 288 | 1656 | −56.751 | −46.529 | 1015.3 | 42.3 | 1.35 |
| S38 | 286 | 1202 | −51.910 | −38.838 | 1023.1 | 52.9 | 1.65 | U | 288 | 1658 | −56.751 | −46.531 | 1015.4 | 42.4 | 1.35 |
| S38 | 286 | 1203 | −51.911 | −38.838 | 1023.2 | 52.6 | 1.64 | U | 288 | 1659 | −56.752 | −46.534 | 1015.3 | 42.5 | 1.36 |
| S38 | 286 | 1212 | −51.913 | −38.836 | 1023.4 | 51.1 | 1.59 | S43 | 288 | 1709 | −56.753 | −46.541 | 1015.5 | 43.5 | 1.38 |
| S38 | 286 | 1214 | −51.913 | −38.836 | 1023.6 | 50.7 | 1.58 | S43 | 288 | 1712 | −56.753 | −46.541 | 1015.5 | 43.8 | 1.38 |
| S38 | 286 | 1225 | −51.913 | −38.836 | 1023.4 | 48.9 | 1.52 | U | 288 | 1840 | −56.787 | −46.726 | 1015.7 | 55.5 | 1.76 |
| S38 | 286 | 1226 | −51.913 | −38.836 | 1023.4 | 48.6 | 1.51 | U | 288 | 1844 | −56.790 | −46.742 | 1015.7 | 56.1 | 1.79 |
| S38 | 286 | 1228 | −51.913 | −38.836 | 1023.3 | 48.3 | 1.50 | U | 288 | 1856 | −56.797 | −46.782 | 1015.7 | 58.0 | 1.88 |
| S38 | 286 | 1258 | −51.917 | −38.835 | 1023.5 | 43.4 | 1.37 | U | 288 | 1858 | −56.798 | −46.785 | 1015.7 | 58.2 | 1.89 |
| S38 | 286 | 1300 | −51.917 | −38.835 | 1023.5 | 43.1 | 1.37 | U | 288 | 1908 | −56.802 | −46.818 | 1015.7 | 59.8 | 1.98 |
| S38 | 286 | 1302 | −51.918 | −38.835 | 1023.6 | 42.8 | 1.36 | U | 288 | 1910 | −56.803 | −46.824 | 1015.7 | 60.1 | 2.00 |
| S38 | 286 | 1319 | −51.920 | −38.838 | 1023.4 | 40.3 | 1.31 | U | 288 | 1919 | −56.808 | −46.855 | 1015.8 | 61.6 | 2.09 |
| S38 | 286 | 1321 | −51.920 | −38.838 | 1023.4 | 40.0 | 1.30 | U | 288 | 1931 | −56.812 | −46.894 | 1015.7 | 63.5 | 2.23 |
| S38 | 286 | 1322 | −51.920 | −38.839 | 1023.3 | 39.8 | 1.30 | U | 288 | 1941 | −56.816 | −46.927 | 1015.8 | 65.2 | 2.37 |
| U | 286 | 1345 | −51.921 | −38.842 | 1023.2 | 36.9 | 1.25 | U | 288 | 1955 | −56.822 | −46.974 | 1015.8 | 67.5 | 2.60 |
| U | 286 | 1347 | −51.921 | −38.843 | 1023.1 | 36.7 | 1.25 | U | 288 | 2008 | −56.828 | −47.016 | 1015.9 | 69.7 | 2.86 |
| U | 286 | 1348 | −51.920 | −38.845 | 1023.1 | 36.5 | 1.24 | U | 288 | 2020 | −56.832 | −47.056 | 1016.0 | 71.8 | 3.16 |
| U | 286 | 1438 | −51.997 | −38.969 | 1022.9 | 32.3 | 1.18 | U | 288 | 2032 | −56.836 | −47.095 | 1016.1 | 73.7 | 3.52 |
| U | 286 | 1440 | −52.001 | −38.974 | 1022.9 | 32.3 | 1.18 | U | 289 | 1404 | −57.773 | −49.794 | 1017.2 | 45.2 | 1.42 |
| U | 286 | 1535 | −52.107 | −39.120 | 1022.3 | 31.9 | 1.18 | U | 289 | 1406 | −57.782 | −49.794 | 1017.2 | 45.1 | 1.41 |
| U | 286 | 1537 | −52.111 | −39.126 | 1022.3 | 31.9 | 1.18 | U | 289 | 1407 | −57.791 | −49.794 | 1017.2 | 45.0 | 1.41 |

**Table F1. (cont.)** A summary of the Sun Photometer Log for AMT-5. All times are in GMT.

| *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* | *Code* | *SDY* | *Time* | *Lon.* | *Lat.* | *P* | *θ* | *A* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | 289 | 1524 | −58.131 | −49.795 | 1017.7 | 41.2 | 1.33 | U | 289 | 1849 | −58.222 | −49.957 | 1017.9 | 57.1 | 1.83 |
| U | 289 | 1525 | −58.136 | −49.795 | 1017.7 | 41.2 | 1.33 | U | 289 | 2005 | −58.144 | −50.145 | 1017.6 | 68.5 | 2.71 |
| U | 289 | 1534 | −58.181 | −49.795 | 1017.8 | 41.1 | 1.32 | U | 289 | 2025 | −58.126 | −50.193 | 1017.5 | 71.7 | 3.16 |
| U | 289 | 1536 | −58.185 | −49.795 | 1017.8 | 41.1 | 1.32 | U | 289 | 2037 | −58.116 | −50.222 | 1017.6 | 73.6 | 3.49 |
| U | 289 | 1538 | −58.194 | −49.795 | 1017.8 | 41.1 | 1.32 | U | 289 | 2106 | −58.092 | −50.293 | 1017.6 | 78.3 | 4.81 |
| S45 | 289 | 1547 | −58.230 | −49.796 | 1018.0 | 41.1 | 1.33 | S46 | 290 | 1134 | −57.694 | −51.661 | 1012.5 | 64.7 | 2.33 |
| S45 | 289 | 1606 | −58.233 | −49.798 | 1017.9 | 41.5 | 1.33 | S46 | 290 | 1135 | −57.694 | −51.661 | 1012.5 | 64.5 | 2.31 |
| S45 | 289 | 1615 | −58.232 | −49.799 | 1018.0 | 41.8 | 1.34 | S46 | 290 | 1137 | −57.695 | −51.661 | 1012.5 | 64.2 | 2.29 |
| S45 | 289 | 1626 | −58.231 | −49.800 | 1017.9 | 42.3 | 1.35 | S46 | 290 | 1145 | −57.698 | −51.662 | 1012.4 | 63.1 | 2.20 |
| S45 | 289 | 1642 | −58.231 | −49.801 | 1018.1 | 43.2 | 1.37 | S46 | 290 | 1146 | −57.699 | −51.662 | 1012.3 | 62.9 | 2.18 |
| S45 | 289 | 1655 | −58.231 | −49.804 | 1018.2 | 44.1 | 1.39 | S46 | 290 | 1148 | −57.699 | −51.663 | 1012.3 | 62.6 | 2.17 |
| S45 | 289 | 1659 | −58.231 | −49.804 | 1018.2 | 44.4 | 1.40 | S46 | 290 | 1156 | −57.701 | −51.664 | 1012.2 | 61.5 | 2.09 |
| S45 | 289 | 1701 | −58.231 | −49.805 | 1018.2 | 44.6 | 1.40 | S46 | 290 | 1203 | −57.704 | −51.665 | 1012.2 | 60.5 | 2.02 |
| S45 | 289 | 1705 | −58.231 | −49.804 | 1018.2 | 44.9 | 1.41 | PS | 290 | 1312 | −57.823 | −51.691 | 1011.5 | 51.6 | 1.61 |
| S45 | 289 | 1707 | −58.231 | −49.804 | 1018.2 | 45.1 | 1.41 | PS | 290 | 1313 | −57.823 | −51.691 | 1011.5 | 51.5 | 1.60 |
| S45 | 289 | 1710 | −58.231 | −49.805 | 1018.1 | 45.3 | 1.42 | PS | 290 | 1457 | −57.823 | −51.691 | 1011.5 | 43.3 | 1.37 |
| U | 289 | 1729 | −58.238 | −49.807 | 1018.2 | 47.1 | 1.47 | PS | 290 | 1635 | −57.823 | −51.691 | 1011.5 | 44.3 | 1.40 |
| U | 289 | 1747 | −58.254 | −49.816 | 1018.3 | 49.0 | 1.52 | PS | 290 | 1707 | −57.823 | −51.691 | 1011.5 | 46.6 | 1.45 |
| U | 289 | 1802 | −58.288 | −49.844 | 1018.2 | 50.8 | 1.58 | PS | 290 | 1843 | −57.823 | −51.691 | 1011.5 | 57.2 | 1.84 |
| U | 289 | 1815 | −58.263 | −49.872 | 1018.0 | 52.4 | 1.64 | PS | 290 | 1946 | −57.823 | −51.691 | 1011.5 | 66.1 | 2.45 |
| U | 289 | 1835 | −58.239 | −49.919 | 1017.8 | 55.1 | 1.74 | | | | | | | | |

**Table G1.** A summary of the XOTD Cast Log for AMT-5. All times are in GMT.

| *Cast* | *S/N* | *SDY* | *Date* | *Time* | *Longitude* | *Latitude* | *Depth* [m] | *SST* [°C] |
|---|---|---|---|---|---|---|---|---|
| 1 | 1015 | 262 | 19 September | 1110 | −18.475 | 47.170 | 754 | 17.3 |
| 2 | 1024 | 263 | 20 September | 1145 | −19.949 | 42.840 | 785 | 19.3 |
| 3 | 1014 | 264 | 21 September | 1210 | −20.000 | 38.693 | 523 | 22.3 |
| 4 | 1023 | 265 | 22 September | 1150 | −19.526 | 35.443 | 276 | 23.7 |
| 5 | 1016 | 269 | 26 September | 1209 | −20.983 | 29.044 | 361 | 24.7 |
| 6 | 1022 | 270 | 27 September | 1153 | −21.000 | 24.141 | | 24.9 |
| 7 | 1019 | 270 | 27 September | 1200 | −21.002 | 24.135 | 298 | 24.9 |
| 8 | 1021 | 273 | 30 September | 1200 | −20.872 | 10.922 | 162 | 29.1 |
| 9 | 1020 | 274 | 1 October | 1200 | −22.471 | 7.022 | 129 | 28.1 |
| 10 | 1013 | 275 | 2 October | 1212 | −24.160 | 2.811 | 542 | 27.6 |
| 11 | 1017 | 276 | 3 October | 1235 | −25.668 | −0.768 | 459 | 26.2 |
| 12 | 1018 | 277 | 4 October | 1314 | −27.393 | −4.786 | 416 | 25.8 |
| 13 | 1064 | 278 | 5 October | 1319 | −29.111 | −8.952 | 520 | 26.3 |
| 14 | 1061 | 279 | 6 October | 1330 | −30.698 | −12.886 | 203 | 26.5 |
| 15 | 1065 | 280 | 7 October | 1220 | −32.363 | −16.687 | 289 | 25.5 |
| 16 | 1062 | 281 | 8 October | 1336 | −34.226 | −20.672 | 679 | 24.0 |
| 17 | 1063 | 282 | 9 October | 1210 | −37.287 | −23.902 | 363 | 22.8 |
| 18 | 1067 | 283 | 10 October | 1220 | −40.984 | −27.692 | 354 | 20.9 |
| 19 | 1068 | 285 | 12 October | 1336 | −48.862 | −35.476 | 602 | 18.8 |
| 20 | 1069 | 286 | 13 October | 1346 | −51.921 | −38.842 | 620 | 14.4 |
| 21 | 1070 | 287 | 14 October | 1349 | −54.514 | −42.250 | 357 | 12.3 |
| 22 | 1064 | 287 | 14 October | 1821 | −54.893 | −42.993 | 283 | 13.2 |
| 23 | | 288 | 15 October | 1420 | −56.686 | −46.046 | 690 | 7.9 |
| 24 | 1066 | 289 | 16 October | 1330 | −57.667 | −49.794 | 300 | 5.6 |

**Table H1.** A summary of the FRRF Tow Log for AMT-5. All times are in GMT.

| *Tow* | *SDY* | *Date* | *Begin* | *Lon.* | *Lat.* | *End* | *Lon.* | *Lat.* | *Time* | *Comment* |
|---|---|---|---|---|---|---|---|---|---|---|
| 501 | 259 | 16 Sep. | 1450 | −1.6530 | 50.430 | 1600 | −8.458 | 48.667 | | FRRF did not wake up. |
| 502 | 261 | 18 Sep. | 1047 | −13.205 | 47.987 | 1419 | | | 3:32 | FRRF not flashing on recovery. |
| 505 | 271 | 28 Sep. | 1000 | −20.500 | 19.718 | 1430 | −20.418 | 19.050 | 4:30 | Pin failure (FRRF 182010 used). |
| 506 | 273 | 30 Sep. | 1155 | −20.870 | 10.922 | 1604 | −21.197 | 10.220 | 4:09 | Data problems w/logger JA8. |
| 507 | 274 | 1 Oct. | 1200 | −22.470 | 7.027 | 1600 | −22.737 | 6.283 | 4:00 | Data problems w/logger JA8. |
| 508 | 275 | 2 Oct. | 1215 | −23.837 | 2.817 | 1635 | −24.232 | 2.633 | 4:20 | Data problems w/logger JA10. |
| 509 | 278 | 5 Oct. | 1318 | −29.115 | −8.967 | 1707 | −29.382 | −9.613 | 3:49 | FRRF logs data for 30 min. |
| 510 | 279 | 6 Oct. | 1328 | −30.705 | −12.877 | 1639 | | | 3:11 | FRRF logs OK; JA10 for 10 min. |
| 511 | 280 | 7 Oct. | 1226 | −32.363 | −16.683 | 1507 | −32.547 | −17.147 | 2:41 | Successful tow. |
| 512 | 281 | 8 Oct. | 1350 | −34.225 | −20.662 | 1635 | −34.557 | −21.082 | 2:45 | Successful tow. |
| 513 | 285 | 12 Oct. | 1342 | −48.863 | −35.492 | 1755 | −49.450 | −36.091 | 4:13 | Successful tow. |
| 514 | 286 | 13 Oct. | 1350 | −51.907 | −39.832 | 1608 | −52.133 | −39.198 | 2:18 | Successful tow. |
| 515 | 287 | 14 Oct. | 1346 | −54.460 | −42.238 | 1643 | −54.867 | −42.797 | 2:57 | Successful tow. |
| 516 | 288 | 15 Oct. | 1346 | −56.700 | −46.043 | 1655 | −56.753 | −46.548 | 3:09 | Successful tow. |
| 517 | 289 | 16 Oct. | 1340 | −57.627 | −49.793 | 1549 | −58.185 | −49.798 | 2:09 | Successful tow. |

**Table I1.** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 257 | 0745 | | U1 | 13.0927 | 53.1248 | | | | 15.85 | 3.0 | 5 reps 2l (each split) | |
| 257 | 1101 | | U2 | 19.3079 | 52.6147 | | 44.0286 | 17.45 | 17.14 | 1.0 | 5 reps 2l (each split) | |
| 257 | 1300 | | U3 | 18.7558 | 52.2795 | | 45.6183 | 18.51 | 18.23 | 1.0 | 4 reps 1l (each split) | |
| 257 | 1500 | | U4 | 18.2358 | 51.9409 | | 46.4170 | 18.67 | 18.33 | 1.0 | 5 reps 1l (each split) | |
| 257 | 1659 | | U5 | 17.5983 | 51.5610 | | 45.9428 | 18.08 | 17.77 | 1.0 | 5 reps 1l (each split) | |
| 257 | 1900 | | U6 | 15.6966 | 51.1301 | | 45.9561 | 18.12 | 17.81 | 1.0 | 5 reps 1l (each split) | |
| 258 | 1029 | 0 | U7 S0 | 9.9167 | 50.7218 | | 45.8828 | 18.16 | 17.84 | 1.0 | 3 reps 1l (each split) | |
| 259 | 1427 | 1 (1) | S1 | −1.0701 | 50.4275 | | 45.2950 | 18.02 | 17.67 | 1.0 | *See Station Log* | |
| 259 | 1700 | | U8 | −2.4445 | 50.2537 | | 43.2457 | 16.90 | 16.53 | 4.3 | 3 reps 1l (each split) | |
| 259 | 1900 | | U9 | −2.9950 | 50.1351 | | 42.6221 | 16.94 | 16.60 | 4.4 | 3 reps 2l (each split) | |
| 259 | 2100 | | U10 | −3.5827 | 50.0098 | | 44.3364 | 16.40 | 16.03 | 7.8 | 3 reps 2l (each split) | |
| 259 | 2300 | | U11 | −4.2084 | 49.8735 | | 44.5440 | 16.82 | 16.51 | 4.6 | 3 reps 2l (each split) | |
| 260 | 0100 | | U12 | −4.9172 | 49.7180 | | 43.6486 | 16.45 | 16.09 | 4.4 | 3 reps 2l (each split) | |
| 260 | 0300 | | U13 | −5.5164 | 49.6028 | | 44.4624 | 16.87 | 16.55 | 3.1 | 3 reps 2l (each split) | |
| 260 | 0500 | | U14 | −6.0338 | 49.5065 | | 44.4851 | 17.25 | 16.93 | 4.1 | 3 reps 2l (each split) | |
| 260 | 0659 | | U15 | −6.5800 | 49.4950 | | 43.8964 | 16.96 | 16.65 | 4.2 | 3 reps 2l (each split) | |
| 260 | 0958 | | U16 | −7.4687 | 49.2851 | | 44.7899 | 16.86 | 16.61 | 3.3 | 3 reps 2l (each split) | |
| 260 | 1100 | | U17 | −7.7587 | 49.0804 | | 45.2754 | 17.06 | 16.80 | 2.3 | 3 reps 2l (each split) | |
| 260 | 1300 | | U18 | −8.2762 | 48.7159 | | 45.5967 | 17.16 | 16.91 | 2.0 | 3 reps 2l (each split) | |
| 260 | 1500 | | U19 | −8.3735 | 48.6784 | | 45.6887 | 17.21 | 16.90 | 2.2 | 3 reps 2l (each split) | |
| 260 | 1625 | 2 (2) | S2 | −8.4423 | 48.6735 | 35.55 | 45.6504 | 17.13 | 16.80 | 2.2 | *See Station Log* | |
| 260 | 1900 | | U20 | −9.1369 | 48.5659 | | 45.6556 | 17.16 | 16.90 | 2.4 | 2 reps 2l (each split) | |
| 260 | 2059 | | U21 | −9.7460 | 48.4659 | | 45.3292 | 16.76 | 16.45 | 4.6 | 2 reps 2l (each split) | |
| 260 | 2300 | | U22 | −10.3236 | 48.3907 | | 46.0968 | 17.48 | 17.23 | 2.9 | 2 reps 2l (each split) | |
| 261 | 0100 | | U23 | −10.8714 | 48.3186 | | 45.6794 | 17.12 | 16.86 | 3.1 | 2 reps 2l (each split) | |
| 261 | 0300 | | U24 | −11.4245 | 48.2358 | | 45.5223 | 16.98 | 16.70 | 3.9 | 2 reps 2l (each split) | |
| 261 | 0500 | | U25 | −11.9834 | 48.1640 | | 46.0556 | 17.45 | 17.17 | 2.8 | 2 reps 2l (each split) | |
| 261 | 0659 | | U26 | −12.4994 | 48.0949 | | 46.1391 | 17.55 | 17.24 | 2.6 | 2 reps 2l (each split) | |
| 261 | 0900 | | U27 | −12.9909 | 48.0165 | | 46.3179 | 17.69 | 17.41 | 2.6 | 2 reps 2l (each split) | |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | 1025 | 3 (3) | S3 | −13.2055 | 47.9834 | 35.63 | 46.3737 | 17.75 | 17.48 | 2.6 | *See Station Log* | |
| 261 | 1307 | | U28 | −13.6502 | 47.8838 | | 46.1980 | 17.64 | 17.36 | 2.3 | 2 reps 2l (each split) | |
| 261 | 1500 | | U29 | −14.0660 | 47.8042 | | 46.2600 | 17.71 | 17.39 | 2.3 | 2 reps 2l (each split) | |
| 261 | 1701 | | U30 | −14.5438 | 47.7287 | | 45.8189 | 17.22 | 16.94 | 3.0 | 2 reps 2l (each split) | |
| 261 | 1900 | | U31 | −14.9753 | 47.6592 | | 46.4161 | 17.73 | 17.44 | 3.4 | 2 reps 2l (each split) | |
| 261 | 2100 | | U32 | −15.3908 | 47.6045 | | 46.2011 | 17.57 | 17.26 | 3.7 | 3 reps 2l (each split) | |
| 261 | 2300 | | U33 | −15.7885 | 47.5476 | | 46.1598 | 17.55 | 17.28 | 3.7 | 2 reps 2l (each split) | |
| 262 | 0100 | | U34 | −16.2183 | 47.4818 | | 46.1171 | 17.51 | 17.22 | 3.8 | 2 reps 2l (each split) | |
| 262 | 0300 | | U35 | −16.6881 | 47.4278 | | 46.1588 | 17.53 | 17.28 | 3.9 | 2 reps 2l (each split) | |
| 262 | 0500 | | U36 | −17.1742 | 47.3758 | | 45.8354 | 17.22 | 16.94 | 3.5 | 2 reps 2l (each split) | |
| 262 | 0659 | | U37 | −17.6976 | 47.3037 | | 45.9356 | 17.34 | 17.21 | 3.2 | 2 reps 2l (each split) | |
| 262 | 0900 | | U38 | −18.2395 | 47.2172 | | 46.8811 | 18.08 | 17.78 | 3.1 | 2 reps 2l (each split) | |
| 262 | 1025 | 4 (4) | S4 | −18.4773 | 47.1707 | 35.76 | 46.8759 | 18.09 | 17.80 | 2.6 | *See Station Log* | |
| 262 | 1300 | | U39 | −18.6347 | 46.9481 | | 47.2324 | 18.23 | 18.01 | 2.9 | 2 reps 2l | 1 rep 1l |
| 262 | 1450 | | U40 | −18.7656 | 46.7510 | | 47.0671 | 18.38 | 18.19 | 3.3 | 2 reps 2l | 1 rep 1l |
| 262 | 1700 | | U41 | −19.0244 | 46.3702 | 35.80 | 47.2366 | 18.40 | 18.17 | 2.4 | 2 reps 2l | 1 rep 1l |
| 262 | 1900 | | U42 | −19.3123 | 45.9898 | 35.69 | 46.6124 | 17.93 | 17.72 | 3.2 | 2 reps 2l | 1 rep 1l |
| 262 | 2100 | | U43 | −19.5830 | 45.6148 | 35.77 | 47.2221 | 18.40 | 18.17 | 2.6 | 3 reps 2l | 1 rep 1l |
| 262 | 2300 | | U44 | −19.8487 | 45.2346 | 35.67 | 46.5556 | 17.88 | 17.63 | 3.1 | 2 reps 2l | 1 rep 1l |
| 263 | 0100 | | U45 | −19.9945 | 44.8240 | 35.66 | 46.5070 | 17.85 | 17.64 | 2.8 | 2 reps 2l | 1 rep 1l |
| 263 | 0300 | | U46 | −20.0097 | 44.3760 | 35.74 | 47.0226 | 18.21 | 17.97 | 2.3 | 2 reps 2l | 1 rep 1l |
| 263 | 0500 | | U47 | −20.0127 | 43.9238 | 35.79 | 47.2841 | 18.46 | 18.19 | 2.5 | 2 reps 2l | 1 rep 1l |
| 263 | 0700 | | U48 | −20.0019 | 43.4757 | 35.82 | 47.7885 | 18.91 | 18.69 | 1.9 | 2 reps 2l | 1 rep 1l |
| 263 | 0900 | | U49 | −19.9776 | 43.0364 | 35.81 | 47.9146 | 19.04 | 18.84 | 2.0 | 2 reps 2l | 1 rep 1l |
| 263 | 1022 | 5 (5) | S5 | −19.9595 | 42.8438 | 35.76 | 48.3425 | 19.41 | 19.17 | 2.6 | *See Station Log* | |
| 263 | 1259 | | U50 | −19.9500 | 42.6307 | 35.88 | 48.3756 | 19.79 | 19.21 | 1.9 | 2 reps 2l | 1 rep 1l |
| 263 | 1405 | | U51 | −19.9672 | 42.4500 | 35.83 | 48.6934 | 20.05 | 19.63 | 1.8 | 2 reps 2l | 1 rep 1l |
| 263 | 1501 | 6 | U52 | −19.9610 | 42.4170 | 35.92 | 49.0817 | 21.14 | 19.85 | 1.7 | 2 reps 2l | 1 rep 1l |
| 263 | 1700 | | U53 | −19.9993 | 42.0343 | 36.14 | 50.4983 | 21.46 | 20.95 | 1.6 | 2 reps 2l | 1 rep 1l |
| 263 | 1900 | | U54 | −20.0016 | 41.7245 | 36.18 | 50.6637 | 21.26 | 21.08 | 1.7 | 2 reps 2l | 1 rep 1l |
| 263 | 2100 | | U55 | −20.0069 | 41.3224 | 35.98 | 50.0484 | 20.93 | 20.72 | 1.6 | 3 reps 2l | 1 rep 1l |
| 263 | 2300 | | U56 | −20.0020 | 40.9291 | 36.15 | 50.9212 | 21.54 | 21.33 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 0100 | | U57 | −19.9997 | 40.5311 | 36.10 | 50.5417 | 21.23 | 21.03 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 0300 | | U58 | −20.0012 | 40.1297 | 36.03 | 50.4217 | 21.21 | 20.99 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 0500 | | U59 | −19.9947 | 39.7265 | | 51.2729 | 21.86 | 21.68 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 0700 | | U60 | −20.0019 | 39.3207 | 36.08 | 51.4704 | 22.13 | 21.92 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 0903 | | U61 | −20.0146 | 38.9000 | 35.83 | 51.9111 | 22.32 | 22.12 | 1.8 | 2 reps 2l | 1 rep 1l |
| 264 | 1023 | 7 (6) | S6 | −20.0128 | 38.7223 | 36.24 | 51.9163 | 22.39 | 22.15 | 1.6 | *See Station Log* | |
| 264 | 1300 | | U63 | −20.0020 | 38.5760 | 36.27 | 52.2163 | 22.61 | 22.41 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 1413 | | U64 | −19.9978 | 38.3757 | 36.29 | 52.3042 | 22.63 | 22.48 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 1503 | | U65 | −20.0004 | 38.2190 | 36.27 | 52.3425 | 22.74 | 22.54 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 1703 | | U66 | −19.9965 | 37.8411 | 36.36 | 52.9001 | 23.12 | 22.92 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 2025 | | U67 | −19.8872 | 37.2278 | | 53.0129 | 23.19 | 22.96 | 1.6 | 2 reps 2l | 1 rep 1l |
| 264 | 2100 | | U68 | −19.8676 | 37.1231 | | 53.1029 | 23.34 | 23.14 | 1.6 | 3 reps 2l | none |
| 264 | 2301 | | U69 | −19.8187 | 36.8718 | 36.30 | 53.1929 | 23.50 | 23.30 | 1.6 | 2 reps 2l | 1 rep 1l |
| 265 | 0103 | | U70 | −19.7506 | 36.4953 | 35.43 | 53.5530 | 23.67 | 23.50 | 1.5 | 2 reps 2l | 1 rep 1l |
| 265 | 0300 | | U71 | −19.6746 | 36.1422 | 36.46 | 53.6710 | 23.74 | 23.65 | 1.5 | 2 reps 2l | 1 rep 1l |
| 265 | 0500 | | U72 | −19.5985 | 35.7933 | 36.38 | 53.5209 | 23.68 | 23.51 | 1.6 | 2 reps 2l | 1 rep 1l |
| 265 | 0700 | 8 | U73 | −19.5324 | 35.4615 | 36.40 | 53.6027 | 23.77 | 23.59 | 1.6 | 2 reps 2l | 1 rep 1l |
| 265 | 1117 | 9 (7) | S8 | −19.5297 | 35.4473 | 36.42 | 53.6275 | 23.82 | 23.67 | 1.6 | *See Station Log* | |
| 265 | 1300 | | U74 | −19.3567 | 35.2623 | 36.45 | 54.0549 | 24.11 | 23.93 | 1.5 | 2 reps 2l | 1 rep 1l |
| 265 | 1430 | 10 | U75 | −19.1445 | 35.0346 | 36.39 | 54.2391 | 24.30 | 24.02 | 1.5 | 2 reps 2l | 1 rep 1l |
| 268 | 1347 | T1 (8) | S9 | −17.2281 | 32.3099 | 36.91 | 54.6376 | 24.14 | 24.02 | 1.4 | *See Station Log* | |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 268 | 1800 | | U76 | −17.8372 | 31.7826 | 37.03 | 55.0785 | 24.35 | 24.15 | 1.5 | 2×2 bottles | 1×1 bottle |
| 268 | 2000 | | U77 | −18.2116 | 31.4750 | 36.99 | 55.0030 | 24.33 | 24.15 | 1.5 | 2×2 bottles | 1×1 bottle |
| 268 | 2200 | | U78 | −18.6060 | 31.1666 | | 55.2007 | 24.45 | 24.27 | 1.5 | 3×2 bottles | 1×1 bottle |
| 269 | 0000 | | U79 | −18.9853 | 30.8372 | | 55.3953 | 24.76 | 24.57 | 1.5 | 2×2 bottles | 1×1 bottle |
| 269 | 0200 | | U80 | −19.3523 | 30.5009 | 36.98 | 55.3611 | 24.67 | 24.49 | 1.5 | 2×2 bottles | 1×1 bottle |
| 269 | 0400 | | U81 | −19.7100 | 30.1564 | 37.26 | 56.1603 | 25.08 | 24.89 | 1.5 | 2×2 bottles | 1×1 bottle |
| 269 | 0600 | | U82 | −20.0680 | 29.8196 | 37.22 | 55.8735 | 24.85 | 24.69 | 1.4 | 2×2 bottles | 1×1 bottle |
| 269 | 0800 | | U83 | −20.4341 | 29.5016 | 37.27 | 55.7441 | 24.69 | 24.52 | 1.5 | 2×2 bottles | 1×1 bottle |
| 269 | 1000 | | U84 | −20.7931 | 29.1917 | 37.29 | 55.9574 | 24.84 | 24.62 | 1.5 | 2×2 bottles | 1×1 bottle |
| 269 | 1135 | 11 (9) | S10 | −20.9718 | 29.0497 | 37.19 | 55.8342 | 24.84 | 24.62 | 1.5 | *See Station Log* | |
| 269 | 1407 | 12 | U85 | −20.9944 | 28.6341 | 37.24 | 56.1696 | 25.09 | 24.88 | 1.4 | 2×2 bottles | 1×1 bottle |
| 269 | 1700 | | U86 | −20.9965 | 28.1127 | 37.27 | 56.2907 | 25.17 | 24.96 | 1.4 | 2×2 bottles | 1×1 bottle |
| 269 | 1855 | | U87 | −20.9861 | 27.6849 | 37.26 | 56.3394 | 25.00 | 24.99 | 1.7 | 2×2 bottles | 1×1 bottle |
| 269 | 2100 | | U88 | −20.9926 | 27.1222 | 37.16 | 56.3736 | 25.35 | 25.16 | 1.5 | 3×2 bottles | 1×1 bottle |
| 269 | 2300 | | U89 | −20.9904 | 26.7727 | 37.13 | 56.0330 | 25.10 | 25.01 | 1.6 | 2×2 bottles | 1×1 bottle |
| 270 | 0100 | | U90 | −20.9989 | 26.4383 | 37.14 | 56.0837 | 25.11 | 24.90 | 1.5 | 2×2 bottles | 1×1 bottle |
| 270 | 0300 | | U91 | −21.0040 | 25.9671 | 37.04 | 55.9543 | 25.11 | 24.94 | 1.5 | 2×2 bottles | 1×1 bottle |
| 270 | 0500 | | U92 | −20.9987 | 25.4952 | 36.97 | 55.8497 | 25.13 | 24.93 | 1.5 | 2×2 bottles | 1×1 bottle |
| 270 | 0700 | | U93 | −20.9904 | 25.0299 | 37.10 | 56.1448 | 25.21 | 25.00 | 1.5 | 2×2 bottles | 1×1 bottle |
| 270 | 0900 | | U94 | −20.9922 | 24.5694 | 37.02 | 56.0806 | 25.26 | 25.08 | 1.4 | 2×2 bottles | 1×1 bottle |
| 270 | 1125 | 13 (10) | S11 | −20.9995 | 24.1386 | 36.89 | 55.7213 | 25.10 | 24.85 | 1.6 | *See Station Log* | |
| 270 | 1418 | 14 | U95 | −21.0084 | 23.7260 | 36.80 | 55.6333 | 25.14 | 24.96 | 1.6 | 2×2 bottles | 1×1 bottle |
| 270 | 1700 | | U96 | −21.0042 | 23.2340 | 36.60 | 55.6737 | 25.42 | 25.27 | 1.6 | 2×2 bottles | 1×1 bottle |
| 270 | 1900 | | U97 | −20.9978 | 22.8109 | 36.69 | 55.9708 | 25.58 | 25.41 | 1.6 | 2×2 bottles | 1×1 bottle |
| 270 | 2100 | | U98 | −20.9902 | 22.3923 | 36.74 | 55.4843 | 25.07 | 24.88 | 1.6 | 2×4,000 ml | 1×1 bottle |
| 270 | 2300 | | U99 | −20.9884 | 21.9895 | 36.74 | 55.5267 | 25.12 | 24.90 | 1.5 | 3×4,000 ml | 1×1 bottle |
| 271 | 0100 | | U100 | −20.9308 | 21.6557 | 35.76 | 55.5484 | 25.11 | 24.90 | 1.6 | 2×2 bottles | 1×1 bottle |
| 271 | 0300 | | U101 | −20.8511 | 21.2383 | 36.30 | 54.4772 | 24.54 | 24.29 | 2.2 | 2×2 bottles | 1×1 bottle |
| 271 | 0500 | | U102 | −20.7646 | 20.8254 | 36.35 | 54.3105 | 24.46 | 24.29 | 2.0 | 2×3,840 ml | 1×1 bottle |
| 271 | 0700 | | U103 | −20.6840 | 20.4489 | 36.31 | 54.9636 | 25.13 | 24.97 | 3.2 | 2×2,500 ml | 1×1 bottle |
| 271 | 0900 | | U104 | −20.5997 | 20.0715 | 36.27 | 55.1726 | 25.37 | 25.18 | 3.5 | 2×1 bottle | 1×1 bottle |
| 271 | 1126 | 15 (11) | S12 | −20.5295 | 19.7244 | 36.28 | 55.2040 | 25.89 | 25.22 | 3.7 | *See Station Log* | |
| 271 | 1500 | | U105 | −20.4454 | 19.2381 | 36.19 | 54.9039 | 25.21 | 25.01 | 4.0 | 2×1 bottle | 1×1 bottle |
| 271 | 1608 | 16 | U106 | −20.4183 | 19.0501 | 36.21 | 55.0039 | 25.29 | 25.10 | 4.2 | 2×1 bottle | 1×1 bottle |
| 271 | 1900 | | U107 | −20.3288 | 18.5598 | 36.22 | 55.2586 | 25.52 | 25.36 | 4.0 | 2×1 bottle | 1×1 bottle |
| 271 | 2100 | | U108 | −20.2369 | 18.1705 | | 55.8134 | 25.94 | 25.78 | 2.0 | 2×1 bottle | 1×1 bottle |
| 271 | 2300 | | U109 | −20.1422 | 17.7976 | | 56.1519 | 26.17 | 26.00 | 1.6 | 3×1 bottle | 1×1 bottle |
| 272 | 0100 | | U110 | −20.0830 | 17.4816 | | 56.9750 | 26.94 | 26.78 | 1.6 | 2×1 bottle | 1×1 bottle |
| 272 | 0300 | | U111 | −20.0100 | 17.0903 | | 56.9689 | 26.98 | 26.81 | 1.6 | 2×1 bottle | 1×1 bottle |
| 272 | 0500 | | U112 | −19.9994 | 16.6999 | 36.29 | 57.2618 | 27.27 | 27.10 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 0700 | | U113 | −20.0008 | 16.3010 | 36.23 | 57.6191 | 27.68 | 27.53 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 0900 | | U114 | −20.0023 | 15.8953 | 36.15 | 57.9929 | 28.13 | 27.98 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 1113 | T2 | S13a | −20.0108 | 15.4926 | 36.25 | 58.0478 | 28.04 | 27.88 | 1.6 | 2×2 bottles | 5×1 bottle |
| 272 | 1345 | | U115 | −20.0137 | 15.0502 | 35.19 | 58.1887 | 28.26 | 28.10 | 1.5 | 2×2 bottles | 1×1 bottle |
| 272 | 1500 | | U116 | −19.9982 | 14.7930 | 36.02 | 58.1897 | 28.47 | 28.38 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 1700 | | U117 | −19.9860 | 14.3880 | 35.72 | 57.7226 | 28.45 | 28.27 | 1.7 | 2×2 bottles | 1×1 bottle |
| 272 | 1850 | | U118 | −19.9940 | 14.0192 | 35.83 | 58.2818 | 28.81 | 28.68 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 2100 | | U119 | −20.0077 | 13.5784 | | 58.0353 | 28.79 | 28.62 | 1.6 | 2×2 bottles | 1×1 bottle |
| 272 | 2300 | | U120 | −20.0164 | 13.1658 | | 57.5952 | 28.73 | 28.58 | 1.6 | 3×2 bottles | 1×1 bottle |
| 273 | 0100 | | U121 | −20.0936 | 12.7765 | 35.31 | 57.6003 | 28.84 | 28.69 | 1.6 | 2×2 bottles | 1×1 bottle |
| 273 | 0300 | | U122 | −20.2485 | 12.4043 | 34.92 | 56.8413 | 28.81 | 28.67 | 1.6 | 2×2 bottles | 1×1 bottle |
| 273 | 0500 | | U123 | −20.4091 | 12.0251 | 35.43 | 57.7091 | 28.85 | 28.69 | 1.6 | 2×2 bottles | 1×1 bottle |
| 273 | 0700 | | U124 | −20.5646 | 11.6401 | 35.51 | 58.0374 | 29.01 | 28.89 | 1.6 | 2×2 bottles | 1×1 bottle |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 273 | 0900 | | U125 | −20.7204 | 11.2730 | 35.54 | 58.0415 | 28.99 | 28.85 | 1.6 | 2×2 bottles | 1×1 bottle |
| 273 | 1127 | 17 (12) | S13 | −20.8702 | 10.9234 | 35.66 | 58.5397 | 29.25 | 28.97 | 1.6 | *See Station Log* | |
| 273 | 1500 | | U126 | −21.1311 | 10.3914 | 35.53 | 58.8173 | 29.68 | 29.53 | 1.6 | 2×1 bottle | 1×1 bottle |
| 273 | 1612 | 18 | U127 | −21.1955 | 10.2193 | 35.59 | 58.5770 | 29.41 | 29.52 | 1.6 | 2×1 bottle | 1×1 bottle |
| 273 | 1900 | | U128 | −21.3468 | 9.8698 | 35.51 | 58.1503 | 29.12 | 28.97 | 1.6 | 2×2 bottles | 1×1 bottle |
| 273 | 2100 | | U129 | −21.4969 | 9.5160 | 35.07 | 56.9778 | 28.58 | 28.41 | 1.7 | 2×2 bottles | 1×1 bottle |
| 273 | 2300 | | U130 | −21.6256 | 9.1695 | 35.49 | 57.6791 | 28.69 | 28.55 | 1.7 | 2×6450 ml | 1×1 bottle |
| 274 | 0100 | | U131 | −21.7333 | 8.8233 | 35.57 | 57.9297 | 28.83 | 28.71 | 1.7 | 2×2 bottles | 1×1 bottle |
| 274 | 0300 | | U132 | −21.8645 | 8.4502 | 35.24 | 57.4450 | 28.82 | 28.68 | 1.5 | 2×2 bottles | 1×1 bottle |
| 274 | 0500 | | U133 | −22.0157 | 8.0807 | 34.31 | 55.9333 | 28.57 | 28.38 | 1.6 | 2×2 bottles | 1×1 bottle |
| 274 | 0700 | | U134 | −22.1669 | 7.7067 | 34.41 | 55.8380 | 28.36 | 28.20 | 1.6 | 2×2 bottles | 1×1 bottle |
| 274 | 0900 | | U135 | −22.2931 | 7.3654 | 34.66 | 56.1600 | 28.43 | 28.29 | 1.6 | 2×2 bottles | 1×1 bottle |
| 274 | 1129 | 19 (13) | S14 | −22.4690 | 7.0269 | 34.26 | 55.3681 | 28.21 | 28.07 | 1.5 | *See Station Log* | |
| 274 | 1500 | | U136 | −22.6631 | 6.4658 | 34.40 | 56.2314 | 28.83 | 28.58 | 1.5 | 2×2 bottles | 1×1 bottle |
| 274 | 1700 | | U137 | −22.8000 | 6.1342 | 33.86 | 55.2376 | 28.62 | 28.43 | 1.5 | 2×2 bottles | 1×1 bottle |
| 274 | 1900 | | U138 | −22.9456 | 5.7801 | 34.54 | 56.1589 | 28.84 | 28.70 | 1.5 | 2×2 bottles | 1×1 bottle |
| 274 | 2100 | | U139 | −23.0996 | 5.4160 | 34.29 | 55.6734 | 28.49 | 28.35 | 1.5 | 2×2 bottles | 1×1 bottle |
| 274 | 2300 | | U140 | −23.2611 | 5.0392 | 34.51 | 56.0202 | 28.49 | 28.36 | 1.4 | 3×2 bottles | 1×1 bottle |
| 275 | 0100 | | U141 | −23.4117 | 4.6694 | 34.85 | 56.0482 | 28.05 | 27.89 | 1.5 | 2×2 bottles | 1×1 bottle |
| 275 | 0300 | | U142 | −23.5630 | 4.2976 | 34.81 | 55.9623 | 28.01 | 27.86 | 1.5 | 2×2 bottles | 1×1 bottle |
| 275 | 0500 | | U143 | −23.7167 | 3.9168 | 34.94 | 56.1901 | 28.04 | 27.90 | 1.6 | 2×2 bottles | 1×1 bottle |
| 275 | 0700 | | U144 | −23.8630 | 3.5507 | 34.92 | 56.0876 | 27.93 | 27.76 | 1.6 | 2×2 bottles | 1×1 bottle |
| 275 | 0900 | | U145 | −24.0213 | 3.1723 | 35.09 | 56.1932 | 27.81 | 27.69 | 1.6 | 2×2 bottles | 1×1 bottle |
| 275 | 1120 | 20 (14) | S15 | −24.1643 | 2.8158 | 35.56 | 56.7351 | 27.74 | 27.62 | 1.6 | *See Station Log* | |
| 275 | 1500 | | U146 | −24.3601 | 2.3302 | 35.91 | 56.8797 | 27.41 | 27.24 | 1.4 | 2×2 bottles | 1×1 bottle |
| 275 | 1641 | 21 | U147 | −24.4651 | 2.0774 | 35.90 | 56.8445 | 27.40 | 27.25 | 1.4 | 2×2 bottles | 1×1 bottle |
| 275 | 1900 | | U148 | −24.5353 | 1.8881 | 35.89 | 56.8062 | 27.38 | 27.24 | 1.5 | 2×2 bottles | 1×1 bottle |
| 275 | 2100 | | U149 | −24.7063 | 1.5335 | 35.85 | 56.6064 | 27.23 | 27.17 | 1.5 | 2×1 bottle | 1×1 bottle |
| 275 | 2300 | | U150 | −24.8526 | 1.1910 | 35.86 | 56.0349 | 26.69 | 26.51 | 1.5 | 3×1 bottle | 1×1 bottle |
| 276 | 0100 | | U151 | −24.9646 | 0.9123 | 36.05 | 56.7472 | 26.21 | 26.16 | 1.8 | 2×1 bottle | 1×1 bottle |
| 276 | 0300 | | U152 | −25.1060 | 0.5418 | 35.11 | 55.7740 | 26.12 | 26.00 | 2.0 | 2×1 bottle | 1×1 bottle |
| 276 | 0500 | | U153 | −25.2575 | 0.1867 | 36.13 | 55.8444 | 26.16 | 26.10 | 1.7 | 2×1 bottle | 1×1 bottle |
| 276 | 0700 | | U154 | −25.4073 | −0.1632 | 36.11 | 55.8092 | 26.17 | 26.02 | 1.8 | 2×1 bottle | 1×1 bottle |
| 276 | 0900 | | U155 | −25.5595 | −0.5136 | 36.09 | 55.7451 | 26.13 | 25.97 | 1.8 | 2×2 bottles | 1×1 bottle |
| 276 | 1100 | 22 (15) | S16 | −25.6631 | −0.7728 | 36.08 | 55.8196 | 26.19 | 26.02 | 1.5 | *See Station Log* | |
| 276 | 1512 | | U156 | −25.8440 | −1.2159 | 36.12 | 56.3527 | 26.66 | 26.51 | 1.5 | 2×2 bottles | 1×1 bottle |
| 276 | 1612 | 23 | U157 | −25.8970 | −1.3585 | 36.12 | 56.1509 | 26.47 | 26.35 | 1.5 | 2×2 bottles | 1×1 bottle |
| 276 | 1904 | | U158 | −26.0067 | −1.6421 | 36.09 | 56.0639 | 26.42 | 26.27 | 1.6 | 2×2 bottles | 1×1 bottle |
| 276 | 2100 | | U159 | −26.1636 | −1.9960 | 36.12 | 56.0204 | 26.35 | 26.20 | 1.6 | 2×2 bottles | 1×1 bottle |
| 276 | 2300 | | U160 | −26.3318 | −2.3725 | 36.21 | 56.2109 | 26.41 | 26.26 | 1.6 | 3×2 bottles | 1×1 bottle |
| 277 | 0052 | | U161 | −26.4831 | −2.7139 | 36.22 | 56.0494 | 26.25 | 26.12 | 1.5 | 2×2 bottles | 1×1 bottle |
| 277 | 0300 | | U162 | −26.6551 | −3.1232 | 36.22 | 56.0505 | 26.25 | 26.11 | 1.5 | 2×2 bottles | 1×1 bottle |
| 277 | 0500 | | U163 | −26.8218 | −3.5120 | 36.22 | 55.9842 | 26.19 | 26.03 | 1.6 | 2×2 bottles | 1×1 bottle |
| 277 | 0700 | | U164 | −26.9968 | −3.9042 | 36.09 | 55.4976 | 25.89 | 25.72 | 1.8 | 2×2 bottles | 1×1 bottle |
| 277 | 0900 | | U165 | −27.1659 | −4.3004 | 35.96 | 55.0908 | 25.69 | 25.50 | 1.8 | 2×2 bottles | 1×1 bottle |
| 277 | 1210 | 24 (16) | S17 | −27.3721 | −4.7851 | 35.92 | 55.0877 | 25.74 | 25.57 | 1.6 | *See Station Log* | |
| 277 | 1500 | | U166 | −27.5195 | −5.1068 | 35.93 | 55.5711 | 26.17 | 26.02 | 1.5 | 2×2 bottles | 1×1 bottle |
| 277 | 1610 | 25 | U167 | −27.5987 | −5.3090 | 35.94 | 55.8444 | 26.41 | 26.22 | 1.4 | 2×2 bottles | 1×1 bottle |
| 277 | 1800 | | U168 | −27.7048 | −5.5598 | 35.95 | 55.7223 | 26.32 | 26.17 | 1.6 | 2×2 bottles | 1×1 bottle |
| 277 | 2000 | | U169 | −27.8751 | −5.9603 | 35.94 | 55.5763 | 26.16 | 26.05 | 1.7 | 2×2 bottles | 1×1 bottle |
| 277 | 2200 | | U170 | −28.0335 | −6.3681 | 36.13 | 55.9397 | 26.27 | 26.07 | 1.6 | 3×2 bottles | 1×1 bottle |
| 278 | 0000 | | U171 | −28.1796 | −6.7787 | 36.21 | 55.9542 | 26.16 | 26.00 | 1.5 | 2×2 bottles | 1×1 bottle |
| 278 | 0200 | | U172 | −28.3263 | −7.1783 | 36.16 | 55.9418 | 26.23 | 26.15 | 1.6 | 2×2 bottles | 1×1 bottle |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 278 | 0400 | | U173 | −28.4899 | −7.5662 | 36.18 | 55.8869 | 26.16 | 25.98 | 1.6 | 2×2 bottles | 1×1 bottle |
| 278 | 0600 | | U174 | −28.6641 | −7.9446 | 36.21 | 55.8993 | 26.11 | 25.91 | 1.6 | 2×2 bottles | 1×1 bottle |
| 278 | 0800 | | U175 | −28.8352 | −8.3228 | 36.43 | 56.4180 | 26.35 | 26.17 | 1.4 | 2×2 bottles | 1×1 bottle |
| 278 | 1000 | | U176 | −29.0078 | −8.6941 | 36.64 | 56.7038 | 26.36 | 26.20 | 1.4 | 2×2 bottles | 1×1 bottle |
| 278 | 1205 | 26 (17) | S18 | −29.1148 | −8.9669 | 36.52 | 56.6675 | 26.44 | 26.29 | 1.4 | *See Station Log* | |
| 278 | 1500 | | U177 | −29.2178 | −9.2558 | 36.53 | 56.8166 | 26.56 | 26.37 | 1.4 | 2×2 bottles | 1×1 bottle |
| 278 | 1713 | 27 | U178 | −29.3813 | −9.6136 | 36.68 | 56.6789 | 26.37 | 26.18 | 1.4 | 2×2 bottles | 1×1 bottle |
| 278 | 2000 | | U179 | −29.5790 | −10.0469 | 36.65 | 56.7649 | 26.36 | 26.15 | 1.3 | 2×2 bottles | 1×1 bottle |
| 278 | 2200 | | U180 | −29.7301 | −10.4280 | 36.69 | 56.8425 | 26.41 | 26.19 | 1.3 | 2×2 bottles | 1×1 bottle |
| 279 | 0000 | | U181 | −29.8718 | −10.8006 | 36.79 | 57.0641 | 26.46 | 26.30 | 1.4 | 3×2 bottles | 1×1 bottle |
| 279 | 0200 | | U182 | −30.0405 | −11.1604 | 36.64 | 56.9326 | 26.37 | 26.37 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 0400 | | U183 | −30.1495 | −11.5173 | 36.69 | 56.9896 | 26.35 | 26.35 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 0600 | | U184 | −30.3075 | −11.8875 | 36.78 | 56.9036 | 26.36 | 26.19 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 0800 | | U185 | −30.4605 | −12.2538 | 36.90 | 56.9948 | 26.27 | 26.09 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 1000 | | U186 | −30.6067 | −12.6201 | 36.89 | 56.9316 | 26.21 | 26.06 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 1148 | 28 (18) | S19 | −30.7053 | −12.8764 | 36.83 | 57.2205 | 26.55 | 26.43 | 1.4 | *See Station Log* | |
| 279 | 1500 | | U187 | −30.7933 | −13.1311 | 36.86 | 57.3768 | 26.66 | 26.53 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 1700 | | U188 | −30.9343 | −13.4360 | 36.76 | 57.2691 | 26.68 | 26.53 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 2000 | | U189 | −31.1681 | −13.9401 | 37.15 | 57.4421 | 26.35 | 26.18 | 1.4 | 2×2 bottles | 1×1 bottle |
| 279 | 2200 | | U190 | −31.3331 | −14.2806 | 37.14 | 57.1998 | 26.16 | 26.00 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 0000 | | U191 | −31.5004 | −14.6360 | 37.14 | 57.3158 | 26.25 | 26.06 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 0200 | | U192 | −31.6542 | −15.0012 | 37.20 | 57.1149 | 26.11 | 25.94 | 1.4 | 3×2 bottles | 1×1 bottle |
| 280 | 0400 | | U193 | −31.8041 | −15.3615 | 37.07 | 57.1553 | 26.20 | 26.02 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 0600 | | U194 | −31.9471 | −15.7163 | 37.27 | 57.5881 | 26.34 | 26.16 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 0800 | | U195 | −32.1074 | −16.0781 | 37.14 | 56.7028 | 25.70 | 25.55 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 1000 | | U196 | −32.2588 | −16.4238 | 37.17 | 56.7007 | 25.66 | 25.51 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 1209 | 29 (19) | S20 | −32.3624 | −16.6864 | 37.16 | 56.6469 | 25.62 | 25.47 | 1.4 | *See Station Log* | |
| 280 | 1518 | 30 | U197 | −32.5471 | −17.1478 | 37.30 | 56.9254 | 25.69 | 25.51 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 1540 | | U198 | −32.5453 | −17.1484 | 37.31 | 56.9078 | 25.68 | 25.52 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 1755 | | U199 | −32.6525 | −17.4666 | 37.30 | 56.9482 | 25.72 | 25.54 | 1.4 | 2×2 bottles | 1×1 bottle |
| 280 | 2000 | | U200 | −32.8071 | −17.8401 | 37.30 | 56.6086 | 25.41 | 25.25 | 1.5 | 2×2 bottles | 1×1 bottle |
| 280 | 2200 | | U201 | −32.9618 | −18.2018 | 37.23 | 56.2007 | 25.13 | 24.94 | 1.5 | 2×1 bottle | 1×1 bottle |
| 281 | 0000 | | U202 | −33.1318 | −18.5673 | 37.27 | 56.1489 | 25.05 | 24.92 | 1.5 | 2×1 bottle | 1×1 bottle |
| 281 | 0200 | | U203 | −33.3057 | −18.9443 | 37.28 | 56.0195 | 24.91 | 24.74 | 1.4 | 3×2 bottles | 1×1 bottle |
| 281 | 0400 | | U204 | −33.4837 | −19.3274 | 37.28 | 56.0661 | 24.95 | 24.74 | 1.4 | 2×2 bottles | 1×1 bottle |
| 281 | 0600 | | U205 | −33.6301 | −19.7061 | 37.25 | 55.9398 | 24.90 | 24.74 | 1.5 | 2×2 bottles | 1×1 bottle |
| 281 | 0800 | | U206 | −33.8317 | −20.0661 | 37.22 | 55.9243 | 24.85 | 24.65 | 1.4 | 2×2 bottles | 1×1 bottle |
| 281 | 1000 | | U207 | −34.0616 | −20.4182 | 37.12 | 54.9647 | 24.14 | 23.94 | 1.5 | 2×2 bottles | 1×1 bottle |
| 281 | 1212 | 31 (20) | S21 | −34.2246 | −20.6623 | 37.11 | 54.9109 | 24.10 | 23.89 | 1.5 | *See Station Log* | |
| 281 | 1530 | | U208 | −34.4123 | −20.9159 | 37.12 | 54.9947 | 24.16 | 23.99 | 1.5 | 2×2 bottles | 1×1 bottle |
| 281 | 1645 | 32 | U209 | −34.5563 | −21.0817 | 37.18 | 55.1562 | 24.25 | 24.05 | 1.5 | 2×2 bottles | 1×1 bottle |
| 281 | 1709 | | U210 | −34.5538 | −21.0834 | 37.17 | 55.1231 | 24.23 | 24.05 | 1.5 | 2×2 bottles | 1×1 bottle |
| 281 | 2000 | | U211 | −34.9845 | −21.5336 | 37.05 | 54.6345 | 23.92 | 23.71 | 1.7 | 2×2 bottles | 1×1 bottle |
| 281 | 2200 | | U212 | −35.2803 | −21.8544 | 36.86 | 53.8966 | 23.48 | 23.29 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 0000 | | U213 | −35.5947 | −22.1657 | 36.93 | 54.0974 | 23.56 | 23.35 | 1.6 | 3×2 bottles | 1×1 bottle |
| 282 | 0200 | | U214 | −35.8807 | −22.4634 | 37.08 | 54.5942 | 23.85 | 23.66 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 0400 | | U215 | −36.1698 | −22.7547 | 37.08 | 54.5993 | 23.85 | 23.66 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 0600 | | U216 | −36.4546 | −23.0483 | 36.92 | 53.9380 | 23.43 | 23.24 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 0800 | | U217 | −36.7453 | −23.3490 | 36.95 | 53.8863 | 23.36 | 23.16 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 1000 | | U218 | −37.0455 | −23.6592 | 36.87 | 53.5965 | 23.18 | 22.98 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 1159 | 33 (21) | S22 | −37.2869 | −23.9024 | 36.79 | 53.2509 | 22.96 | 22.74 | 1.6 | *See Station Log* | |
| 282 | 1409 | | U219 | −37.7538 | −24.1565 | 36.86 | 53.4910 | 23.10 | 22.90 | 1.5 | 2×2 bottles | 1×1 bottle |
| 282 | 1600 | | U220 | −37.8374 | −24.4640 | 36.81 | 53.3089 | 22.98 | 22.74 | 1.5 | 2×2 bottles | 1×1 bottle |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 282 | 1742 | | U221 | −38.1160 | −24.7558 | 36.83 | 53.1568 | 22.82 | 22.61 | 1.6 | 2×2 bottles | 1×1 bottle |
| 282 | 1951 | | U222 | −38.4696 | −25.1227 | 36.82 | 53.1195 | 22.80 | 22.61 | 1.5 | 2×2 bottles | 1×1 bottle |
| 282 | 2200 | | U223 | −38.7928 | −25.4868 | 36.47 | 51.3650 | 21.57 | 21.41 | 1.6 | 2×2 bottles | 1×1 bottle |
| 283 | 0000 | | U224 | −39.1074 | −25.8142 | 26.34 | 50.8116 | 21.20 | 21.07 | 1.6 | 3×2 bottles | 1×1 bottle |
| 283 | 0200 | | U225 | −39.3668 | −26.0654 | 36.31 | 50.4093 | 20.86 | 20.67 | 1.7 | 2×2 bottles | 1×1 bottle |
| 283 | 0400 | | U226 | −39.7221 | −26.3987 | 36.16 | 49.8468 | 20.50 | 20.32 | 1.7 | 2×2 bottles | 1×1 bottle |
| 283 | 0600 | | U227 | −40.0711 | −26.7370 | 36.60 | 50.9296 | 21.06 | 20.96 | 2.0 | 2×2 bottles | 1×1 bottle |
| 283 | 0800 | | U228 | −40.4099 | −27.0777 | 36.61 | 51.0837 | 21.15 | 20.97 | 2.1 | 2×2 bottles | 1×1 bottle |
| 283 | 1000 | | U229 | −40.7422 | −27.4302 | 36.72 | 51.9039 | 21.78 | 21.60 | 2.1 | 2×2 bottles | 1×1 bottle |
| 283 | 1212 | 34 (22) | S23 | −40.9842 | −27.6920 | 36.58 | 50.9730 | 21.08 | 20.86 | 2.5 | *See Station Log* | |
| 283 | 1402 | | U230 | −41.2803 | −27.9752 | 36.60 | 51.0113 | 21.09 | 20.95 | 2.3 | 2×2 bottles | 1×1 bottle |
| 283 | 1600 | | U231 | −41.6077 | −28.3178 | 36.53 | 50.4807 | 20.67 | 20.48 | 2.4 | 2×2 bottles | 1×1 bottle |
| 283 | 1754 | | U232 | −41.9180 | −28.6592 | 36.61 | 51.1478 | 21.20 | 20.99 | 2.3 | 2×2 bottles | 1×1 bottle |
| 283 | 2000 | | U233 | −42.2487 | −29.0333 | 36.16 | 48.3291 | 19.04 | 18.85 | 2.9 | 2×2 bottles | 1×1 bottle |
| 283 | 2200 | | U234 | −42.5926 | −29.3666 | 35.90 | 46.8242 | 17.87 | 17.67 | 2.5 | 2×1 bottle | 1×1 bottle |
| 284 | 0000 | | U235 | −42.9322 | −29.6716 | 36.17 | 48.0056 | 18.71 | 18.52 | 3.3 | 2×1 bottle | 1×1 bottle |
| 284 | 0200 | | U236 | −43.2105 | −29.9305 | 36.14 | 47.9673 | 18.72 | 18.51 | 3.2 | 2×1 bottle | 1×1 bottle |
| 284 | 0400 | | U237 | −43.5340 | −30.2771 | 36.06 | 47.2201 | 18.09 | 17.88 | 3.6 | 2×1 bottle | 1×1 bottle |
| 284 | 0600 | | U238 | −43.8666 | −30.6140 | 36.11 | 47.4805 | 18.28 | 18.07 | 4.1 | 2×1 bottle | 1×1 bottle |
| 284 | 0800 | | U239 | −44.1977 | −30.9586 | 36.10 | 47.3710 | 18.19 | 17.99 | 4.6 | 2×1 bottle | 1×1 bottle |
| 284 | 1000 | | U240 | −44.5309 | −31.3052 | 36.11 | 47.4092 | 18.22 | 17.99 | 6.1 | 2×1 bottle | 1×1 bottle |
| 284 | 1223 | 35 (23) | S24a | −44.8707 | −31.6208 | 36.11 | 47.5291 | 18.34 | 18.11 | 5.2 | 3×1 bottle | 1×1 bottle |
| 284 | 1410 | | U241 | −44.9504 | −31.6765 | 36.12 | 47.8071 | 18.58 | 18.36 | 5.4 | 2×1 bottle | 1×1 bottle |
| 284 | 1550 | | U242 | −45.2575 | −31.9665 | 26.22 | 48.2878 | 18.93 | 18.81 | 6.3 | 2×1 bottle | 1×1 bottle |
| 284 | 1700 | | U243 | −45.4629 | −32.1796 | 36.28 | 48.5441 | 19.12 | 18.89 | 6.9 | 2×1 bottle | 1×1 bottle |
| 284 | 1800 | | U244 | −45.6311 | −32.3654 | 36.13 | 48.3735 | 19.12 | 18.91 | 5.4 | 2×1 bottle | 1×1 bottle |
| 284 | 2000 | | U245 | −45.9628 | −32.7261 | 36.12 | 48.5472 | 19.33 | 19.13 | 4.4 | 2×1 bottle | 1×1 bottle |
| 284 | 2200 | | U246 | −46.3061 | −33.0600 | 36.20 | 48.7984 | 19.41 | 19.29 | 4.9 | 2×1 bottle | 1×1 bottle |
| 285 | 0000 | | U247 | −46.6407 | −33.3885 | 35.86 | 47.9177 | 18.73 | 18.45 | 4.3 | 3×1 bottle | 1×1 bottle |
| 285 | 0200 | | U248 | −46.9884 | −33.7177 | 35.88 | 47.5290 | 18.81 | 18.60 | 3.4 | 2×1 bottle | 1×1 bottle |
| 285 | 0400 | | U249 | −47.3602 | −34.0535 | 35.81 | 46.4016 | 17.50 | 17.25 | 6.2 | 2×1 bottle | 1×1 bottle |
| 285 | 0600 | | U250 | −47.7459 | −34.4067 | 35.86 | 46.1991 | 17.34 | 17.14 | 7.9 | 2×1 bottle | 1×1 bottle |
| 285 | 0800 | | U251 | −48.1015 | −34.7771 | 35.08 | 43.3553 | 15.36 | 15.21 | 9.4 | 2×1 bottle | 1×1 bottle |
| 285 | 1000 | | U252 | −48.4584 | −35.0975 | 36.20 | 48.4676 | 19.13 | 18.91 | 6.7 | 2×1 bottle | 1×1 bottle |
| 285 | 1124 | | U253 | −48.6874 | −35.3100 | 36.11 | 48.1616 | 18.85 | 18.62 | 4.3 | 2×1 bottle | 1×1 bottle |
| 285 | 1301 | 36 (24) | S24 | −48.8611 | −35.4860 | 35.83 | 47.8805 | 19.00 | 18.76 | 4.6 | *See Station Log* | |
| 285 | 1513 | | U254 | −49.0364 | −35.6901 | 35.16 | 45.4820 | 17.06 | 16.93 | 5.1 | 2×1 bottle | 1×1 bottle |
| 285 | 1655 | | U255 | −49.2923 | −35.9447 | 35.50 | 46.8945 | 18.41 | 18.19 | 4.7 | 2×1 bottle | 1×1 bottle |
| 285 | 1803 | 37 | U256 | −49.4495 | −36.0907 | 36.16 | 48.5379 | 19.27 | 19.12 | 4.2 | 2×1 bottle | 1×1 bottle |
| 285 | 1927 | | U257 | −49.5476 | −36.1742 | 36.24 | 48.5638 | 19.18 | 18.96 | 5.1 | 2×1 bottle | 1×1 bottle |
| 285 | 2100 | | U258 | −49.8002 | −36.4161 | 36.23 | 48.3446 | 18.98 | 18.75 | 4.6 | 2×1 bottle | 1×1 bottle |
| 285 | 2300 | | U259 | −50.1161 | −36.7288 | 34.39 | 45.2350 | 17.88 | 17.46 | 4.3 | 2×1 bottle | 1×1 bottle |
| 286 | 0100 | | U260 | −50.4439 | −37.0381 | 34.76 | 45.4602 | 17.86 | 17.65 | 4.6 | 3×1 bottle | 1×1 bottle |
| 286 | 0300 | | U261 | −50.6871 | −37.3012 | 35.57 | 47.1063 | 18.54 | 18.33 | 4.1 | 2×1 bottle | 1×1 bottle |
| 286 | 0500 | | U262 | −50.9962 | −37.6798 | 35.50 | 40.5731 | 14.18 | 13.89 | 18.3 | 2×1 bottle | 1×1 bottle |
| 286 | 0700 | | U263 | −51.2929 | −38.0307 | 34.73 | 43.2530 | 16.20 | 16.12 | 13.9 | 2×2 bottles | 1×1 bottle |
| 286 | 0900 | | U264 | −51.5355 | −38.3600 | 35.48 | 42.7513 | 14.35 | 14.10 | 16.6 | 2×1 bottle | 1×1 bottle |
| 286 | 1052 | | U265 | −51.7868 | −38.6744 | 35.57 | 43.1179 | 14.58 | 14.31 | 14.3 | 2×1 bottle | 1×1 bottle |
| 286 | 1231 | 38 (25) | S25 | −51.9135 | −38.8360 | 35.54 | 43.0807 | 14.58 | 14.32 | 14.3 | *See Station Log* | |
| 286 | 1516 | | U266 | −52.0715 | −39.0677 | 35.30 | 44.5214 | 16.28 | 15.95 | 13.0 | 2×1 bottle | 1×1 bottle |
| 286 | 1623 | 39 | U267 | −52.1431 | −39.1970 | 35.27 | 43.6011 | 15.39 | 15.15 | 17.8 | 2×1 bottle | 1×1 bottle |
| 286 | 1652 | 39 | U268 | −52.1240 | −39.1981 | 35.29 | 43.5320 | 15.30 | 15.01 | 19.2 | 2×1 bottle | 1×1 bottle |
| 286 | 1813 | | U269 | −52.1903 | −39.3093 | 35.27 | 43.5361 | 15.32 | 15.08 | 20.8 | 2×1 bottle | 1×1 bottle |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 286 | 1900 | | U270 | −52.2345 | −39.4231 | 35.58 | 44.4325 | 16.11 | 15.87 | 19.1 | 2×1 bottle | 1×1 bottle |
| 286 | 2000 | | U271 | −52.3612 | −37.5754 | 35.70 | 44.8860 | 16.21 | 15.98 | 19.6 | 2×1 bottle | 1×1 bottle |
| 286 | 2100 | | U272 | −52.4721 | −39.7374 | 35.61 | 44.6650 | 16.08 | 15.85 | 18.9 | 2×1 bottle | 1×1 bottle |
| 286 | 2200 | | U273 | −52.5732 | −39.8961 | 35.66 | 44.7476 | 16.11 | 15.87 | 18.6 | 2×1 bottle | 1×1 bottle |
| 286 | 2300 | | U274 | −52.6905 | −40.0700 | 35.25 | 44.3623 | 16.18 | 15.83 | 16.8 | 2×1 bottle | 1×1 bottle |
| 287 | 0000 | | U275 | −52.8298 | −40.2430 | 35.01 | 42.0451 | 14.10 | 13.25 | 22.5 | 2×1 bottle | 1×1 bottle |
| 287 | 0100 | | U276 | −52.9735 | −40.3937 | 34.28 | 38.8450 | 11.56 | 11.28 | 25.4 | 2×1 litre | 1×1 litre |
| 287 | 0200 | | U277 | −53.0412 | −40.4898 | 34.41 | 39.2793 | 11.90 | 11.16 | 24.8 | 2×1 litre | 1×1 litre |
| 287 | 0300 | | U278 | −53.1829 | −40.6563 | 34.22 | 39.4743 | 12.14 | 12.07 | 27.7 | 3×1 bottle | 1×1 bottle |
| 287 | 0400 | | U279 | −53.3034 | −40.8075 | 34.11 | 38.0765 | 10.89 | 10.58 | 25.3 | 2×1 bottle | 1×1 bottle |
| 287 | 0500 | | U280 | −53.4207 | −40.9770 | 33.91 | 35.7358 | 8.59 | 8.57 | 27.4 | 2×1 bottle | 1×1 bottle |
| 287 | 0600 | | U281 | −53.5424 | −41.1219 | 34.04 | 34.8823 | 7.53 | 7.29 | 27.6 | 2×1,195 ml | 1,324 ml |
| 287 | 0700 | | U282 | −53.6919 | −41.2899 | 34.71 | 38.7542 | 11.01 | 10.77 | 28.1 | 2×1 litre | 1×1 litre |
| 287 | 0800 | | U283 | −53.8176 | −41.4542 | 34.70 | 38.7078 | 10.97 | 10.65 | 29.9 | 2×1 bottle | 1×1 bottle |
| 287 | 0900 | | U284 | −53.9522 | −41.6341 | 34.69 | 38.4386 | 10.69 | 10.41 | 27.3 | 2×1 bottle | 1×1 bottle |
| 287 | 1000 | | U285 | −54.0729 | −41.8050 | 34.25 | 36.6595 | 9.24 | 8.89 | 25.3 | 2×1 bottle | 1×1 bottle |
| 287 | 1100 | | U286 | −54.2228 | −41.9878 | 34.10 | 36.3131 | 9.02 | 8.74 | 25.1 | 2×1 bottle | 1×1 bottle |
| 287 | 1255 | 40 (26) | S26 | −54.4690 | −42.2401 | 35.09 | 40.5434 | 12.48 | 12.20 | 22.4 | *See Station Log* | |
| 287 | 1500 | | U287 | −54.6649 | −42.4623 | 35.27 | 41.4661 | 13.23 | 12.93 | 16.9 | 2×1 bottle | 1×1 bottle |
| 287 | 1600 | | U288 | −54.7872 | −42.6564 | 35.27 | 41.5734 | 13.34 | 13.05 | 16.6 | 2×1 bottle | 1×1 bottle |
| 287 | 1705 | 41 (27) | S27 | −54.8676 | −42.8016 | 35.30 | 41.1714 | 13.45 | 13.19 | 18.3 | *See Station Log* | |
| 287 | 1900 | | U289 | −54.9786 | −42.9540 | 35.29 | 41.7293 | 13.47 | 13.17 | 17.6 | 2×1 bottle | 1×1 bottle |
| 287 | 2000 | | U290 | −55.1108 | −43.1684 | 34.11 | 36.5791 | 9.29 | 8.95 | 19.6 | 2×1 bottle | 1×1 bottle |
| 287 | 2100 | | U291 | −55.2454 | −43.3691 | 34.29 | 36.2575 | 8.77 | 8.39 | 24.7 | 2×1 bottle | 1×1 bottle |
| 287 | 2200 | | U292 | −55.4006 | −43.6580 | 34.90 | 38.2519 | 10.19 | 9.27 | 21.6 | 2×1 bottle | 1×1 bottle |
| 287 | 2300 | | U293 | −55.5396 | −43.7464 | 34.56 | 38.2209 | 10.47 | 9.91 | 22.1 | 2×1 bottle | 1×1 bottle |
| 288 | 0000 | | U294 | −55.6900 | −43.9238 | 34.66 | 38.0260 | 10.38 | 10.13 | 20.0 | 3×1 bottle | 1×1 bottle |
| 288 | 0100 | | U295 | −55.8264 | −44.0764 | 34.84 | 39.2195 | 11.36 | 11.19 | 19.3 | 2×1 bottle | 1×1 bottle |
| 288 | 0200 | | U296 | −55.9166 | −44.2046 | 34.79 | 39.0730 | 11.26 | 10.95 | 18.8 | 2×1 bottle | 1×1 bottle |
| 288 | 0300 | | U302 | −55.0530 | −44.3871 | 34.07 | 35.3080 | 7.96 | 7.63 | 16.8 | 2×1 bottle | 1×1 bottle |
| 288 | 0400 | | U303 | −56.2076 | −44.5678 | 34.11 | 35.6121 | 8.25 | 7.92 | 20.9 | 2×1 bottle | 1×1 bottle |
| 288 | 0500 | | U304 | −56.3466 | −44.7303 | 34.05 | 35.0596 | 7.71 | 7.42 | 25.7 | 2×1 bottle | 1×1 bottle |
| 288 | 0600 | | U305 | −56.5039 | −44.9129 | 34.10 | 35.5327 | 8.17 | 7.90 | 26.2 | 2×1 bottle | 1×1 bottle |
| 288 | 0700 | | U297 | −56.5931 | −45.0886 | 34.15 | 35.6204 | 8.22 | 7.92 | 22.7 | 2×1 bottle | 1×1 bottle |
| 288 | 0800 | | U298 | −56.6151 | −45.2959 | 34.14 | 35.4719 | 8.07 | 7.76 | 21.5 | 2×1 bottle | 1×1 bottle |
| 288 | 0900 | | U299 | −56.6402 | −45.4737 | 34.20 | 35.7100 | 8.28 | 7.98 | 18.7 | 2×1 bottle | 1×1 bottle |
| 288 | 1000 | | U300 | −56.6654 | −45.6781 | 34.21 | 35.7533 | 8.31 | 8.02 | 19.4 | 2×1 bottle | 1×1 bottle |
| 288 | 1100 | | U301 | −56.6840 | −45.8629 | 34.19 | 35.6946 | 8.26 | 7.95 | 16.2 | 2×1 bottle | 1×1 bottle |
| 288 | 1231 | 42 (28) | S28 | −56.6956 | −46.0459 | 34.13 | 35.5162 | 8.13 | 7.83 | 16.8 | *See Station Log* | |
| 288 | 1526 | | U306 | −56.7074 | −46.2284 | 34.11 | 35.5266 | 8.16 | 7.83 | 14.7 | 2×1 bottle | 1×1 bottle |
| 288 | 1610 | | U307 | −56.7253 | −46.3722 | 34.13 | 35.4678 | 8.07 | 7.71 | 14.2 | 2×1 bottle | 1×1 bottle |
| 288 | 1727 | 43 (29) | S29 | −56.7502 | −46.5426 | 34.11 | 35.4771 | 8.10 | 7.79 | 14.6 | *See Station Log* | |
| 288 | 1910 | | U308 | −56.8023 | −46.2212 | 34.13 | 35.2029 | 7.78 | 7.47 | 14.1 | 2×1 bottle | 1×1 bottle |
| 288 | 2045 | | U309 | −56.8413 | −47.1330 | 34.13 | 34.7206 | 7.26 | 6.96 | 14.6 | 2×1 bottle | 1×1 bottle |
| 288 | 2300 | | U310 | −56.8793 | −47.5631 | 34.09 | 32.6856 | 5.02 | 4.69 | 16.1 | 2×1 bottle | 1×1 bottle |
| 289 | 0100 | | U311 | −56.9319 | −47.9482 | 34.11 | 32.7660 | 5.08 | 4.75 | 17.5 | 2×1 bottle | 1×1 bottle |
| 289 | 0300 | | U312 | −57.0169 | −48.3270 | 34.09 | 32.4251 | 4.78 | 4.49 | 16.2 | 2×1 bottle | 1×1 bottle |
| 289 | 0500 | | U313 | −57.0715 | −48.6837 | 34.08 | 33.0431 | 5.43 | 5.74 | 14.5 | 3×1 bottle | 1×1 bottle |
| 289 | 0700 | | U314 | −57.1283 | −49.0482 | 34.07 | 33.2419 | 5.67 | 5.38 | 13.8 | 2×1 bottle | 1×1 bottle |
| 289 | 0900 | | U315 | −57.2015 | −44.4125 | 33.97 | 33.3274 | 5.85 | 5.58 | 12.6 | 2×1 bottle | 1×1 bottle |
| 289 | 1100 | | U316 | −57.2422 | −49.7760 | 33.88 | 33.3016 | 5.92 | 5.60 | 12.6 | 2×1 bottle | 1×1 bottle |
| 289 | 1252 | 44 (30) | S30 | −57.6615 | −49.7933 | 33.93 | 33.3181 | 5.89 | 5.57 | 11.6 | *See Station Log* | |
| 289 | 1519 | | U317 | −58.1041 | −49.7949 | 33.93 | 33.4490 | 6.04 | 5.70 | 10.1 | 2×1 bottle | 1×1 bottle |

**Table I1. (cont.)** A summary of the Underway Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *Sta.* | *Sample* | *Lon.* | *Lat.* | *S* | *C* | $T_s$ | *SST* | *F* | HPLC | Chl. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 289 | 1629 | 45 (31) | `S31` | −58.2306 | −49.8000 | 33.94 | 33.5572 | 6.11 | 5.75 | 9.5 | *See Station Log* | |
| 289 | 1918 | | `U318` | −58.1921 | −50.0277 | 33.87 | 33.7241 | 6.41 | 6.02 | 9.8 | 2×1 bottle | 1×1 bottle |
| 289 | 2100 | | `U319` | −58.0977 | −50.2755 | 33.83 | 33.4562 | 6.14 | 5.81 | 12.7 | 2×1 bottle | 1×1 bottle |
| 289 | 2300 | | `U320` | −57.9870 | −50.5822 | 33.90 | 33.4707 | 6.06 | 5.72 | 14.0 | 2×1 bottle | 1×1 bottle |
| 290 | 0100 | | `U321` | −57.8369 | −50.9018 | 33.88 | 33.3707 | 5.99 | 5.64 | 12.2 | 2×1 bottle | 1×1 bottle |
| 290 | 0300 | | `U322` | −57.6651 | −51.2284 | 33.83 | 33.0698 | 5.71 | 5.39 | 11.0 | 2×1 bottle | 1×1 bottle |
| 290 | 0500 | | `U323` | −57.5114 | −51.5127 | 33.83 | 33.2141 | 5.90 | 5.59 | 14.5 | 2×1 bottle | 1×1 bottle |
| 290 | 0700 | | `U324` | −57.3608 | −51.6730 | 33.84 | 33.1523 | 5.80 | 5.47 | 11.5 | 2×1 bottle | 1×1 bottle |
| 290 | 0900 | | `U325` | −57.4552 | −51.6733 | 33.80 | 33.1636 | 5.85 | 5.49 | 10.3 | 2×1 bottle | 1×1 bottle |
| 290 | 1105 | 46 | `U326` | −57.6923 | −51.6589 | 33.73 | 33.1358 | 5.88 | 5.56 | 18.6 | 2×1 bottle | 1×1 bottle |
| 290 | 1146 | 46 | `U327` | −57.6982 | −51.6623 | 33.75 | 33.1141 | 5.84 | 5.53 | 18.6 | 2×1 litre | 1×1 litre |

**Table I2.** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 259 | 1427 | 1 | `S1` | −1.0701 | 50.4275 | | 17.67 | 1.0 | 2 | 4 reps 1l; 4 reps 0.5l (split) | | |
| | | | | | | | | | 5 | 3 reps 1l | | |
| | | | | | | | | | 10 | 3 reps 1l | | |
| | | | | | | | | | 15 | 3 reps 1l | | |
| | | | | | | | | | 25 | 3 reps 1l | | |
| 260 | 1625 | 2 | `S2` | −8.4423 | 48.6735 | 35.55 | 16.80 | 2.2 | 5 | 3 reps 2l (each split) | | |
| | | | | | | | | | 10 | 2 reps 2l (each split) | | |
| | | | | | | | | | 15 | 2 reps 2l (each split) | | |
| | | | | | | | | | 25 | 2 reps 2l (each split) | | |
| | | | | | | | | | 35 | 3 reps 2l (each split) | | |
| | | | | | | | | | 45 | 2 reps 2l (each split) | | |
| | | | | | | | | | 60 | 3 reps 2l (each split) | | |
| | | | | | | | | | 80 | 2 reps 2l (each split) | | |
| | | | | | | | | | 100 | 2 reps 2l (each split) | | |
| | | | | | | | | | 120 | 2 reps 2l (each split) | | |
| 261 | 1025 | 3 | `S3` | −13.2055 | 47.9834 | 35.63 | 17.48 | 2.6 | 5 | 3 reps 2l (each split) | | |
| | | | | | | | | | 10 | 2 reps 2l (each split) | | |
| | | | | | | | | | 15 | 2 reps 2l (each split) | | |
| | | | | | | | | | 30 | *No Sample Available* | | |
| | | | | | | | | | 40 | 3 reps 2l (each split) | | |
| | | | | | | | | | 60 | 2 reps 2l (each split) | | |
| | | | | | | | | | 80 | 3 reps 2l (each split) | | |
| | | | | | | | | | 100 | 2 reps 2l (each split) | | |
| | | | | | | | | | 160 | 2 reps 2l (each split) | | |
| | | | | | | | | | 250 | 2 reps 2l (each split) | | |
| 262 | 1025 | 4 | `S4` | −18.4773 | 47.1707 | 35.76 | 17.80 | 2.6 | 5 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 10 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 20 | 1 rep 2l | 1 rep 1l | |
| | | | | | | | | | 40 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 50 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 65 | *Did Not Fire* | | |
| | | | | | | | | | 80 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 100 | *Did Not Fire* | | |
| | | | | | | | | | 160 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 250 | 2 reps 2l | 1 rep 1l | |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 263 | 1021 | 5 | S5 | −19.9595 | 42.8438 | 35.86 | 19.17 | 1.8 | 5 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 10 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 20 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 30 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 40 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 50 | 2 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 60 | 3 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 100 | 2 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 160 | 2 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 250 | 2 reps 2l | 1 rep 1l | |
| 264 | 1023 | 6 | S6 | −20.0128 | 38.7223 | 36.24 | 22.15 | 1.6 | 5 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 10 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 20 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 40 | 2 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 65 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 80 | 3 reps 2l | 1 rep 1l | |
| | | | | | | | | | 90 | 3 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 120 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 160 | 2 reps 2l | 1 rep 1l | From 2nd CTD cast. |
| | | | | | | | | | 250 | 2 reps 2l | 1 rep 1l | |
| 265 | 1017 | 7 | S8 | −19.5297 | 35.4473 | 36.42 | 23.67 | 1.6 | 5 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 10 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 20 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 40 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 60 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 75 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 85 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 100 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 120 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 160 | 2 reps 2l | 1 rep 1l | |
| | | | | | | | | | 250 | 2 reps 2l | 1 rep 1l | |
| 268 | 1347 | 8 | S9 | −17.2281 | 32.3099 | 36.91 | 24.02 | 1.4 | 7 | 2×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 75 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 620 ml | |
| | | | | | | | | | 120 | 2×2 bottles | 860 ml | |
| | | | | | | | | | 160 | | *Did Not Fire* | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 269 | 1135 | 9 | S10 | −20.9718 | 29.0497 | 37.19 | 24.62 | 1.5 | 7 | 2×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×2 bottles | 640 ml | |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 140 | 2×2 bottles | 945 ml | |
| | | | | | | | | | 160 | 2×2 bottles | 960 ml | |
| | | | | | | | | | 180 | | *Did Not Fire* | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 270 | 1125 | 10 | S11 | −20.9995 | 24.1386 | 36.89 | 24.85 | 1.6 | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×2 bottles | 725 ml | |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 75 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 3×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | 100 and 120 m |
| | | | | | | | | | 120 | 2×2 bottles | 790 ml | pooled. |
| | | | | | | | | | 150 | 2×2 bottles | 1,020 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 271 | 1126 | 11 | S12 | −20.5295 | 19.7244 | 36.28 | 25.22 | 3.7 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 2×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 25 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |
| 273 | 1127 | 12 | S13 | −20.8702 | 10.9234 | 35.66 | 28.97 | 1.6 | 5 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×3,135 ml | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 43 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×2 bottles | 980 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 274 | 1129 | 13 | S14 | −22.4690 | 7.0269 | 34.26 | 28.07 | 1.5 | 2 | 2×2 bottles | 670 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 47 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 65 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×2 bottles | 1,020 ml | |
| | | | | | | | | | 160 | 2×2 bottles | 975 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 275 | 1120 | 14 | S15 | −24.1643 | 2.8158 | 35.56 | 27.62 | 1.6 | 2 | 2×2 bottles | 665 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 75 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 125 | 2×2 bottles | 865 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 910 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 276 | 1100 | 15 | S16 | −25.6631 | −0.7728 | 36.08 | 26.02 | 1.5 | 2 | 2×2 bottles | 660 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 955 ml | |
| | | | | | | | | | 140 | 2×2 bottles | 1,075 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 277 | 1210 | 16 | S17 | −27.3721 | −4.7851 | 35.92 | 25.57 | 1.6 | 2 | 2×2 bottles | 665 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 65 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 83 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×2 bottles | 995 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 910 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 278 | 1205 | 17 | S18 | −29.1148 | −8.9669 | 36.52 | 26.29 | 1.4 | 2 | 2×2 bottles | 660 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 140 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×2 bottles | 940 ml | |
| | | | | | | | | | 200 | 2×2 bottles | 1,090 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 279 | 1148 | 18 | S19 | −30.7053 | −12.8764 | 36.83 | 26.43 | 1.4 | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 860 ml | |
| | | | | | | | | | 40 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 140 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 156 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 180 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 200 | 2×2 bottles | 920 ml | |
| | | | | | | | | | 220 | 2×2 bottles | 670 ml | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |
| 280 | 1209 | 19 | S20 | −32.3624 | −16.6864 | 37.16 | 25.47 | 1.4 | 2 | 2×2 bottles | 700 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 50 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 141 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×2 bottles | 1,070 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 945 ml | |
| | | | | | | | | | 200 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×2 bottles | 1×1 bottle | |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 281 | 1212 | 20 | S21 | −34.2246 | −20.6623 | 37.11 | 23.89 | 1.5 | 2 | 2×2 bottles | 410 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 50 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 110 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 125 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 137 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 145 | 2×2 bottles | 1,920 ml | |
| | | | | | | | | | 160 | 2×2 bottles | 1,080 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 705 ml | |
| | | | | | | | | | 200 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×2 bottles | 2,000 ml | |
| 282 | 1159 | 21 | S22 | −37.2869 | −23.9024 | 36.79 | 23.66 | 1.6 | 2 | 2×2 bottles | 600 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 107 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×2 bottles | 2,000 ml | |
| | | | | | | | | | 140 | 2×2 bottles | 1,065 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 820 ml | |
| | | | | | | | | | 200 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×2 bottles | 2,000 ml | |
| 283 | 1151 | 22 | S23 | −40.9842 | −27.6920 | 36.58 | 20.86 | 2.5 | 2 | 2×2 bottles | 700 ml | |
| | | | | | | | | | 7 | 3×2 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 75 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 95 | 2×2 bottles | 2,000 ml | |
| | | | | | | | | | 120 | 2×2 bottles | 970 ml | |
| | | | | | | | | | 160 | 2×2 bottles | 660 ml | |
| | | | | | | | | | 180 | 2×2 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×2 bottles | 1,995 ml | |
| 285 | 1301 | 24 | S24 | −48.8611 | −35.4860 | 35.83 | 18.76 | 4.6 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 45 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 55 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 70 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | All cryovials for |
| | | | | | | | | | 200 | 2×1 bottles | 1×1 bottle | S24 are wrongly |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | marked JD 284. |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 286 | 1231 | 25 | S25 | −51.9135 | −38.8360 | 35.54 | 14.32 | 14.3 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 24 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 70 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |
| 287 | 1255 | 26 | S26 | −54.4690 | −42.2401 | 35.09 | 12.20 | 22.4 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 25 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 3×1 bottles | 1×1 bottle | |
| | | | | | | | | | 65 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 75 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 125 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |
| 287 | 1705 | 27 | S27 | −54.8676 | −42.8016 | 35.30 | 13.19 | 18.3 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 70 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 150 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 200 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 300 | 2×1 bottles | 1×1 bottle | Validation CDT. |
| 288 | 1231 | 28 | S28 | −56.6956 | −46.0459 | 34.13 | 7.83 | 14.9 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 50 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |

**Table I2. (cont.)** A summary of the Station Filtration Log for AMT-5. All times are in GMT.

| *SDY* | *Time* | *CTD* | *Sta.* | *Lon.* | *Lat.* | *S* | *T* | *F* | *Depths* | HPLC | Chl. | *Notes* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 288 | 1727 | 29 | S29 | −56.7502 | −46.5426 | 34.11 | 7.79 | 14.6 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 28 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 35 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 45 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 55 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 65 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 90 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 110 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 160 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |
| 289 | 1252 | 30 | S30 | −57.6615 | −49.7933 | 33.93 | 5.57 | 11.6 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 150 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 180 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |
| 289 | 1629 | 31 | S31 | −58.2306 | −49.8000 | 33.94 | 5.75 | 9.5 | 2 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 7 | 3×1 bottles | 1×1 bottle | From nontoxic. |
| | | | | | | | | | 10 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 20 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 30 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 40 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 60 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 80 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 100 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 120 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 150 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 180 | 2×1 bottles | 1×1 bottle | |
| | | | | | | | | | 250 | 2×1 bottles | 1×1 bottle | |

**Table J1.** A summary of the Nutrients Sample Log for AMT-5. All times are in GMT. CTD cast 23 was aborted, so no samples were collected from this cast.

| *Date* | *SDY* | *CTD* | *Depths* | *Lon.* | *Lat.* | *Date* | *SDY* | *CTD* | *Depths* | *Lon.* | *Lat.* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 Sep. | 259 | 1 | 3 | −1.39 | 50.28 | 2 Oct. | 275 | 14 | 11 | −24.10 | 2.49 |
| 17 Sep. | 260 | 2 | 7 | −8.27 | 48.40 | 3 Oct. | 276 | 15 | 10 | −25.40 | −0.47 |
| 18 Sep. | 261 | 3 | 10 | −13.12 | 47.59 | 4 Oct. | 277 | 16 | 11 | −27.22 | −4.47 |
| 19 Sep. | 262 | 4 | 9 | −18.29 | 47.11 | 5 Oct. | 278 | 17 | 11 | −29.07 | −8.58 |
| 20 Sep. | 263 | 5/5a | 11 | −19.58 | 42.51 | 6 Oct. | 279 | 18 | 11 | −30.42 | 12.53 |
| 21 Sep. | 264 | 6 | 11 | −20.00 | 38.43 | 7 Oct. | 280 | 19 | 11 | −32.22 | 16.41 |
| 22 Sep. | 265 | 7 | 4 | −19.32 | 35.27 | 8 Oct. | 281 | 20 | 11 | −34.14 | 20.40 |
| 22 Sep. | 265 | 7 | 11 | −19.32 | 35.27 | 9 Oct. | 282 | 21 | 10 | −37.17 | 23.54 |
| 25 Sep. | 268 | 8 | 8 | −17.14 | 32.19 | 10 Oct. | 283 | 22 | 11 | −40.59 | 27.42 |
| 26 Sep. | 269 | 9 | 8 | −20.58 | 20.03 | 11 Oct. | 284 | 23 | 0 | −44.52 | 31.37 |
| 27 Sep. | 270 | 10 | 10 | −20.60 | 24.08 | 12 Oct. | 285 | 24 | 11 | −48.52 | 35.29 |
| 28 Sep. | 271 | 11 | 10 | −20.32 | 19.43 | 13 Oct. | 286 | 25 | 11 | −51.55 | 38.50 |
| 30 Sep. | 273 | 12 | 11 | −20.52 | 10.55 | 14 Oct. | 287 | 26 | 11 | −54.27 | 42.14 |
| 1 Oct. | 274 | 13 | 11 | −22.29 | 7.02 | | | | | | |

**Table K1.** A summary of the Nitrate Sample Log for AMT-5. All times are in GMT. CTD cast 23 was aborted, so no samples were collected from this cast.

| *Date* | *SDY* | *CTD* | *Depth* [m] | *Lon.* | *Lat.* | *Date* | *SDY* | *CTD* | *Depth* [m] | *Lon.* | *Lat.* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 Sep. | 261 | 3 | 15 | −13.12 | 47.59 | 4 Oct. | 277 | 16 | 20 | −27.22 | −4.47 |
| 19 Sep. | 262 | 4 | 20 | −18.29 | 47.11 | 5 Oct. | 278 | 17 | 20 | −29.07 | −8.58 |
| 20 Sep. | 263 | 5/5a | 20 | −19.58 | 42.51 | 6 Oct. | 279 | 18 | 40 | −30.42 | −12.53 |
| 21 Sep. | 264 | 6 | 20 | −20.00 | 38.43 | 7 Oct. | 280 | 19 | 50 | −32.22 | −16.41 |
| 22 Sep. | 265 | 7 | 20 | −19.32 | 35.27 | 8 Oct. | 281 | 20 | 60 | −34.14 | −20.40 |
| 26 Sep. | 269 | 9 | 20 | −20.58 | 20.03 | 9 Oct. | 282 | 21 | 50 | −37.17 | −23.54 |
| 27 Sep. | 270 | 10 | 20 | −20.60 | 24.08 | 10 Oct. | 283 | 22 | 20 | −40.59 | −27.42 |
| 28 Sep. | 271 | 11 | 10 | −20.32 | 19.43 | 11 Oct. | 284 | 23 | | −44.52 | −31.37 |
| 30 Sep. | 273 | 12 | 10 | −20.52 | 10.55 | 12 Oct. | 285 | 24 | 20 | −48.52 | −35.29 |
| 1 Oct. | 274 | 13 | 20 | −22.29 | 7.02 | 13 Oct. | 286 | 25 | 10 | −51.55 | −38.50 |
| 2 Oct. | 275 | 14 | 20 | −24.10 | 2.49 | 14 Oct. | 287 | 26 | 10 | −54.27 | −42.14 |
| 3 Oct. | 276 | 15 | 20 | −25.40 | −0.47 | 15 Oct. | 288 | 27 | 10 | | |

**Table L1.** A summary of the OPC Sample Log for AMT-5. All times are in GMT. The Biomass, >2,000 $\mu$m, and OPC column entries are from 200 m samples.

| *Date* | *SDY* | *Time* | *Biomass* | *> 2,000 $\mu$m* | *OPC* | *20 m* | *Extras* | *No.* | *Underway* | *Time* | *Duration* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 Sep. | 259 | 1400 | | | | 1 | Not thru OPC. | | 1 | 1843 | 1.88 |
| 17 Sep. | 260 | 1600 | 1 | 1 | | 1 | 100 m only. | | | | |
| 18 Sep. | 261 | 1000 | 1 | 1 | 1 | | | | 1 | 0730 | 1.50 |
| 18 Sep. | 261 | | | | | | | | 1 | 1430 | 2.00 |
| 18 Sep. | 261 | | | | | | | | 1 | 1850 | 1.67 |
| 19 Sep. | 262 | 1000 | 1 | | 1 | 1 | | | 1 | 0730 | 1.86 |
| 19 Sep. | 262 | | | | | | | | 1 | 1230 | 2.17 |
| 20 Sep. | 263 | 1000 | 1 | 1 | 1 | 1 | | | 1 | 0100 | 2.17 |
| 20 Sep. | 263 | | | | | | | | 1 | 1500 | 3.00 |
| 20 Sep. | 263 | | | | | | | | 1 | 1941 | 2.00 |

**Table L1. (cont.)** A summary of the OPC Sample Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Time* | *Biomass* | *>2,000 μm* | *OPC* | *20 m* | *Extras* | *No.* | *Underway* | *Time* | *Duration* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 Sep. | 264 | 1000 | 1 | 1 | 1 | 1 | | | 1 | 1440 | 3.67 |
| 21 Sep. | 264 | 2200 | 1 | 1 | 1 | | | | | | |
| 22 Sep. | 265 | 0700 | 1 | 1 | 1 | | 200 m | 2 | 1 | 1240 | 5.42 |
| 22 Sep. | 265 | 1000 | 1 | 1 | 1 | 1 | | | | | |
| 25 Sep. | 268 | 1330 | 1 | 1 | 1 | | | | | | |
| 26 Sep. | 269 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0815 | 2.00 |
| 26 Sep. | 269 | 2300 | 1 | 1 | 1 | | | | 1 | 1400 | 2.00 |
| 27 Sep. | 270 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0640 | 4.25 |
| 27 Sep. | 270 | 2300 | 1 | 1 | 1 | | | | 1 | 1355 | 4.75 |
| 28 Sep. | 271 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0915 | 1.50 |
| 28 Sep. | 271 | 2300 | 1 | 1 | 1 | | | | 1 | 1525 | 1.77 |
| 29 Sep. | 272 | 1100 | 1 | 1 | 1 | | | | 1 | 1400 | 2.17 |
| 30 Sep. | 273 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0810 | 2.35 |
| 30 Sep. | 273 | | | | | | | | 1 | 1331 | 1.83 |
| 30 Sep. | 273 | | | | | | | | 1 | 2034 | 3.12 |
| 1 Oct. | 274 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0900 | 1.75 |
| 1 Oct. | 274 | | | | | | | | 1 | 1650 | 2.50 |
| 1 Oct. | 274 | | | | | | | | 1 | 2142 | 1.92 |
| 2 Oct. | 275 | 1100 | 1 | 1 | 1 | 1 | | | 1 | 0854 | 1.70 |
| 2 Oct. | 275 | 2300 | 1 | 1 | 1 | | | | 1 | 1645 | 2.33 |
| 3 Oct. | 276 | 1030 | 1 | 1 | 1 | 1 | | | 1 | 1520 | 3.00 |
| 4 Oct. | 277 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 0955 | 1.67 |
| 4 Oct. | 277 | | | | | | | | 1 | 1700 | 0.80 |
| 4 Oct. | 277 | | | | | | | | 1 | 2130 | 2.67 |
| 5 Oct. | 278 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 1500 | 2.50 |
| 5 Oct. | 278 | | | | | | | | 1 | 2145 | 4.75 |
| 6 Oct. | 279 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 1700 | 2.67 |
| 6 Oct. | 279 | | | | | | | | 1 | 2140 | 1.50 |
| 7 Oct. | 280 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 0930 | 1.75 |
| 7 Oct. | 280 | | | | | | | | 1 | 1530 | 3.67 |
| 8 Oct. | 281 | 1130 | 1 | 1 | 1 | 1 | 200 m thru OPC | 1 | 1 | 0920 | 0.47 |
| 8 Oct. | 281 | | | | | | | | 1 | 1545 | 3.92 |
| 8 Oct. | 281 | | | | | | | | 1 | 2115 | 12.67 |
| 9 Oct. | 282 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 1555 | 4.33 |
| 9 Oct. | 282 | 2359 | 1 | 1 | 1 | | | | 1 | 2130 | 2.17 |
| 10 Oct. | 283 | 1130 | 1 | 1 | 1 | 1 | | | 1 | 1810 | 1.55 |
| 10 Oct. | 283 | 2359 | 1 | 1 | 1 | | | | | | |
| 11 Oct. | 284 | 1130 | 1 | 1 | 1 | 1 | 200 m 1/2 thru OPC | 1 | 1 | 0945 | 2.00 |
| 11 Oct. | 284 | 1130 | | | | | 20 m not thru OPC | 1 | 1 | 1555 | 3.17 |
| 12 Oct. | 285 | 1230 | 1 | 1 | 1 | 1 | | | 1 | 1000 | 3.00 |
| 12 Oct. | 285 | 0100 | 1 | 1 | 1 | | | | 1 | 1655 | |
| 13 Oct. | 286 | 1200 | 1 | 1 | 1 | 1 | | | 1 | 1040 | 1.00 |
| 13 Oct. | 286 | 0100 | 1 | 1 | 1 | | | | 1 | 1542 | 2.75 |
| 13 Oct. | 286 | | | | | | | | 1 | 2142 | 1.00 |
| 13 Oct. | 286 | | | | | | | | 1 | 0215 | 0.58 |
| 14 Oct. | 287 | 1230 | 1 | 1 | 1 | 1 | | | 1 | 1530 | 2.17 |
| 14 Oct. | 287 | 0100 | | | | | | | 1 | 2210 | 0.50 |
| 14 Oct. | 287 | | | | | | | | 1 | 2340 | 0.50 |
| 15 Oct. | 288 | 1200 | 1 | 1 | 1 | 1 | | | 1 | 0950 | 0.50 |
| 15 Oct. | 288 | | | | | | | | 1 | 1635 | 4.42 |
| 16 Oct. | 289 | 1230 | 1 | 1 | 1 | 1 | | | 1 | 1115 | 1.42 |
| 16 Oct. | 289 | | | | | | | | 1 | 1435 | 4.42 |
| | | *Total* | 38 | 37 | 37 | 26 | | 5 | 57 | | |

**Table M1.** A summary of the CHN Sample Log for AMT-5. All times are in GMT and all volumes are in liters. For the zooplankton samples, all portions were 50. The $S_1$, $S_2$, and $S_3$, zooplankton entries correspond to the 1,000–2,000 $\mu$m, 500–1,000 $\mu$m, and 200–500 $\mu$m size fractions, respectively. For the particulate samples, the $V_1$, $V_2$, $V_3$, and $V_4$ entries correspond to $< 200\,\mu$m (surface), $< 5\,\mu$m (surface), $< 200\,\mu$m (chlorophyll maximum), and $< 5\,\mu$m (chlorophyll maximum), respectively. The fractional numbers in front of the particulate sample numbers are the filtered volumes in liters. The blanks on SDY 277 and 281 are GF/F blanks, and the blank on SDY 273 is an in-line total.

| *Zooplankton* | | | | | | | | | *Particulates* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *SDY* | *Sta.* | *Net* | *Vol.* | *Tray* | $S_1$ | $S_2$ | $S_3$ | *Blanks* | *Tray* | $V_1$ | $V_2$ | $V_3$ | $V_4$ |
| 260 | 1600 | 52 | 1.00 | 1 | B1-3 | B4-6 | B7-9 | | 1 | 0.50 A1-3 | 0.25 A4-6 | 0.25 A7-9 | 0.25 A10-12 |
| 261 | 1000 | 26 | 0.50 | 1 | D1-3 | D4-6 | D7-9 | | 1 | 0.50 C1-3 | 0.50 C4-6 | 0.50 C7-9 | 0.50 C10-12 |
| 262 | 1000 | 26 | 0.50 | 2 | A1-3 | A4-6 | A7-9 | | 2 | 0.50 B1-3 | 0.50 B4-6 | 0.50 B7-9 | 0.50 B10-12 |
| 263 | 1000 | 26 | 0.50 | 3 | A1-3 | A4-6 | A7-9 | A10-12 | 2 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 264 | 1000 | 26 | 0.50 | 3 | C1-3 | C4-6 | C7-9 | | 3 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 264 | 2200 | 26 | 0.50 | 3 | E1-3 | E4-6 | E7-9 | | | | | | |
| 265 | 1000 | 26 | 0.50 | 3 | F1-3 | F4-6 | F7-9 | | 3 | 0.50 G1-3 | 0.50 G4-6 | 0.50 G7-9 | 0.50 G10-12 |
| 265 | 0700 | 26 | 0.50 | 3 | H1-3 | H4-6 | H7-9 | H10-12 | | | | | |
| 268 | 1330 | 26 | 0.50 | 4 | B1-3 | B4-6 | B7-9 | | 4 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 269 | 1100 | 26 | 0.50 | 4 | C1-3 | C4-6 | C7-9 | C10-12 | 4 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 270 | 1100 | 26 | 0.50 | 5 | B1-3 | B4-6 | B7-9 | | 5 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 270 | 2300 | 26 | 1.00 | 5 | C1-3 | C4-6 | C7-9 | | | | | | |
| 271 | 1100 | 26 | 1.00 | 6 | A1-3 | A4-6 | A7-9 | | 5 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 271 | 2300 | 26 | 1.00 | 6 | B1-3 | B4-6 | B7-9 | | | | | | |
| 272 | 1100 | 26 | 0.50 | 6 | C1-3 | C4-6 | C7-9 | C10-12 | | | | | |
| 273 | 1100 | 26 | 1.00 | 7 | B1-3 | B4-6 | B7-9 | B10-12 | 7 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 274 | 1100 | 26 | 0.50 | 7 | D1-3 | D4-6 | D7-9 | | 7 | 0.50 C1-3 | 0.50 C4-6 | 0.50 C7-9 | 0.50 C10-12 |
| 275 | 1100 | 26 | 0.50 | 8 | B1-3 | B4-6 | B7-9 | | 8 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 275 | 2300 | 26 | 1.00 | 8 | C1-3 | C4-6 | C7-9 | | | | | | |
| 276 | 1030 | 26 | 0.50 | 8 | E1-3 | E4-6 | E7-9 | E10-12 | 8 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 277 | 1130 | 26 | 1.00 | 9 | B1-3 | B4-6 | B7-9 | B10-12 | 9 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 278 | 1130 | 26 | 0.50 | 9 | D1-3 | D4-6 | D7-9 | | 9 | 0.50 C1-3 | 0.50 C4-6 | 0.50 C7-9 | 0.50 C10-12 |
| 279 | 1130 | 26 | 0.50 | 10 | B1-3 | B4-6 | B7-9 | B10-12 | 10 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 280 | 1130 | 26 | 0.50 | 10 | D1-3 | D4-6 | D7-9 | | 10 | 1.00 C1-3 | 1.00 C4-6 | 0.50 C7-9 | 0.50 C10-12 |
| 281 | 1130 | 26 | 0.50 | 10 | F1-3 | F4-6 | F7-9 | F10-12 | 10 | 1.00 E1-3 | 1.00 E4-6 | 0.50 E7-9 | 0.50 E10-12 |
| 282 | 1130 | 26 | 0.50 | 11 | B1-3 | B4-6 | B7-9 | | 11 | 1.00 A1-3 | 1.00 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 282 | 2400 | 26 | 1.00 | 11 | C1-3 | C4-6 | C7-9 | | | | | | |
| 283 | 1130 | 26 | 0.50 | 12 | B1-3 | B4-6 | B7-9 | B10-12 | 12 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 283 | 2400 | 26 | 1.00 | 12 | C1-3 | C4-6 | C7-9 | | | | | | |
| 284 | 1130 | 26 | 0.50 | 12 | E1-3 | E4-6 | E7-9 | | 12 | 0.50 D1-3 | 0.50 D4-6 | | |
| 285 | 1230 | 26 | 0.50 | 13 | B1-3 | B4-6 | B7-9 | | 13 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 285 | 0100 | 26 | 1.00 | 13 | C1-3 | C4-6 | C7-9 | | | | | | |
| 286 | 1200 | 26 | 1.00 | 13 | E1-3 | E4-6 | E7-9 | | 13 | 0.50 D1-2 | 0.50 D3-5 | 0.50 D6-8 | 0.50 D9-11 |
| 286 | 0100 | 26 | 1.00 | 13 | F1-3 | F4-6 | F7-9 | | | | | | |
| 287 | 1230 | 26 | 1.00 | 14 | B1-3 | B4-6 | B7-9 | | 14 | 0.50 A1-3 | 0.50 A4-6 | 0.50 A7-9 | 0.50 A10-12 |
| 287 | 0100 | 26 | 1.00 | 14 | C1-3 | C4-6 | C7-9 | | | | | | |
| 288 | 1200 | 26 | 0.50 | 14 | E1-3 | E4-6 | E7-9 | | 14 | 0.50 D1-3 | 0.50 D4-6 | 0.50 D7-9 | 0.50 D10-12 |
| 289 | 1230 | 26 | 0.50 | 14 | G1-3 | G4-6 | G7-9 | | 14 | 0.50 F1-3 | 0.50 F4-6 | 0.50 F7-9 | 0.50 F10-12 |

**Table N1.** A summary of the Microzooplankton Sample Log for AMT-5. All times are in GMT.

| *Date* | *SDY* | *Longitude* | *Latitude* | *CTD* | *Depths* [m] |
|---|---|---|---|---|---|
| 18 September | 261 | −13.2058 | 47.9833 | 3 | 5, 10, 40, 100 |
| 19 September | 262 | −18.4803 | 47.1727 | 4 | 5, 20, 50, 80 |
| 20 September | 263 | −19.9615 | 42.8430 | 5 | 5, 20, 40, 80 |
| 21 September | 264 | −20.0117 | 38.7167 | 6 | 5, 20, 40, 65, 80, 100 |
| 22 September | 265 | −19.5238 | 35.4460 | 7 | 5, 20, 40, 60, 85, 100 |
| 26 September | 269 | −20.9677 | 29.0473 | 9 | 7, 20, 40, 80, 120, 130 |
| 27 September | 270 | −20.9987 | 24.1360 | 10 | 7, 20, 40, 75, 90, 100 |
| 28 September | 271 | −20.5270 | 19.7193 | 11 | 2, 10, 20, 30, 40, 100 |
| 30 September | 273 | −20.8697 | 10.9212 | 12 | 5, 20, 30, 42, 80, 100 |
| 1 October | 274 | −22.4690 | 7.0265 | 13 | 2, 20, 40, 48, 60, 100 |
| 2 October | 275 | −24.1642 | 2.8173 | 14 | 2, 20, 40, 60, 75, 100 |
| 3 October | 276 | −25.6630 | −0.7745 | 15 | 2, 20, 40, 60, 80, 100 |
| 4 October | 277 | −27.3678 | −4.7857 | 16 | 2, 20, 40, 65, 80, 100 |
| 5 October | 278 | −29.1157 | −8.9663 | 17 | 2, 20, 60, 100, 120, 130 |
| 6 October | 279 | −30.7057 | −12.8765 | 18 | 7, 20, 40, 100, 160, 180 |
| 7 October | 280 | −32.3630 | −16.6843 | 19 | 2, 50, 100, 120, 140, 160 |
| 8 October | 281 | −34.2227 | −20.6633 | 20 | 2, 20, 110, 137, 160 |
| 9 October | 282 | −37.2868 | −23.9025 | 21 | 2, 20, 50, 80, 110, 140 |
| 10 October | 283 | −40.6905 | −27.6905 | 22 | 2, 20, 35, 50, 75, 95 |
| 12 October | 285 | −48.8618 | −35.4890 | 24 | 2, 20, 35, 55, 70, 90 |
| 13 October | 286 | −51.9128 | −38.8367 | 25 | 2, 10, 20, 24, 40, 70 |
| 14 October | 287 | −54.4580 | −42.2392 | 26 | 2, 10, 25, 35, 50, 90 |

**Table O1.** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 2 | 1 | *Neogloboquadrina pachyderma* | 1 | 260 | 17 September |
| | 2 | *Globorotalia inflata* | 1 | 260 | 17 September |
| | 3 | *Globigerina bulloides* | 1 | 260 | 17 September |
| | 4 | *Globigerina bulloides* | 1 | 260 | 17 September |
| | 5 | *Globigerinella siphonifera* | 1 | 260 | 17 September |
| | 14 | *Neogloboquadrina pachyderma* | 1 | 261 | 18 September |
| | 100 | *Globigerina bulloides* | 3 | 266 | 23 September |
| 3 | 6 | *Globorotalia scitula* | 1 | 261 | 18 September |
| | 7 | *Globigerinoides sacculifer* | 1 | 261 | 18 September |
| | 8 | *Globigerinoides sacculifer* | 1 | 261 | 18 September |
| | 9 | *Globigerinoides sacculifer* | 1 | 261 | 18 September |
| | 10 | *Globigerinella siphonifera* | 1 | 261 | 18 September |
| | 11 | *Globorotalia inflata* | 1 | 261 | 18 September |
| | 12 | *Globorotalia inflata* | 1 | 261 | 18 September |
| | 13 | *Neogloboquadrina dutertrei* (incompta) | 1 | 261 | 18 September |
| 4 | 15 | *Globorotalia scitula* | 1 | 262 | 19 September |
| | 16 | *Globorotalia scitula* | 1 | 262 | 19 September |
| | 17 | *Globorotalia scitula* | 5 | 262 | 19 September |
| | 18 | *Neogloboquadrina pachyderma* | 1 | 262 | 19 September |
| | 19 | *Neogloboquadrina pachyderma* | 1 | 262 | 19 September |
| | 20 | *Neogloboquadrina pachyderma* | 1 | 262 | 19 September |
| | 21 | *Neogloboquadrina pachyderma* | 1 | 262 | 19 September |
| | 22 | *Neogloboquadrina pachyderma* | 1 | 262 | 19 September |
| | 23 | *Globigerina incompta* | 1 | 262 | 19 September |
| | 24 | *Orbulina universa* | 1 | 262 | 19 September |
| | 25 | *Orbulina universa* | 1 | 262 | 19 September |
| | 26 | *Orbulina universa* | 1 | 262 | 19 September |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 4 | 27 | *Globigerinoides ruber* (pink variety) | 1 | 262 | 19 September |
| | 28 | *Globigerinoides ruber* (white variety) | 1 | 262 | 19 September |
| | 101 | *Globigerinoides ruber* (white variety) | 6 | 266 | 23 September |
| 5 | 29 | *Orbulina universa* | 1 | 263 | 20 September |
| | 30 | *Orbulina universa* | 1 | 263 | 20 September |
| | 31 | *Orbulina universa* | 1 | 263 | 20 September |
| | 32 | *Globorotalia scitula* | 1 | 263 | 20 September |
| | 33 | *Globorotalia scitula* | 3 | 263 | 20 September |
| | 34 | *Globigerinoides ruber* (white variety) | 1 | 263 | 20 September |
| | 35 | *Globigerinoides ruber* (white variety) | 1 | 263 | 20 September |
| | 36 | *Globigerinoides sacculifer* | 1 | 263 | 20 September |
| | 37 | *Globigerinoides sacculifer* | 1 | 263 | 20 September |
| | 38 | *Globigerinoides sacculifer* | 1 | 263 | 20 September |
| | 39 | *Globigerinella siphonifera* | 1 | 263 | 20 September |
| | 40 | *Globigerinella siphonifera* | 1 | 263 | 20 September |
| | 41 | *Globigerinella siphonifera* | 1 | 263 | 20 September |
| | 42 | *Globigerinita minuta* | 1 | 263 | 20 September |
| 6 | 43 | *Orbulina universa* | 1 | 264 | 21 September |
| | 44 | *Orbulina universa* | 1 | 264 | 21 September |
| | 45 | *Orbulina universa* | 1 | 264 | 21 September |
| | 46 | *Orbulina universa* | 1 | 264 | 21 September |
| | 47 | *Orbulina universa* | 1 | 264 | 21 September |
| | 48 | *Globigerinoides ruber* (pink variety) | 1 | 264 | 21 September |
| | 49 | *Globigerinoides ruber* (pink variety) | 1 | 264 | 21 September |
| | 50 | *Globigerinoides ruber* (pink variety) | 1 | 264 | 21 September |
| | 51 | *Globigerinoides ruber* (pink variety) | 5 | 264 | 21 September |
| | 52 | *Globigerinoides sacculifer* | 1 | 264 | 21 September |
| | 53 | *Globigerinoides sacculifer* | 1 | 264 | 21 September |
| | 54 | *Globigerinoides sacculifer* | 1 | 264 | 21 September |
| | 55 | *Hastigerina pelagica* | 1 | 264 | 21 September |
| | 56 | *Hastigerina pelagica* | 1 | 264 | 21 September |
| | 57 | *Hastigerina pelagica* | 1 | 264 | 21 September |
| | 58 | *Hastigerina pelagica* | 7 | 264 | 21 September |
| | 59 | *Globigerinoides conglobatus* | 1 | 264 | 21 September |
| | 60 | *Globigerinoides conglobatus* | 1 | 264 | 21 September |
| | 61 | *Globigerinoides conglobatus* | 1 | 264 | 21 September |
| | 62 | *Globigerinoides conglobatus* | 1 | 264 | 21 September |
| | 63 | *Globigerinoides conglobatus* | 6 | 264 | 21 September |
| | 64 | *Globorotalia scitula* | 1 | 264 | 21 September |
| | 65 | *Globigerinita glutinata* | 1 | 264 | 21 September |
| | 66 | *Globigerinita glutinata* | 1 | 264 | 21 September |
| | 67 | *Globigerinita glutinata* | 3 | 264 | 21 September |
| | 68 | *Globigerinita glutinata* | 2 | 264 | 21 September |
| 7 | 69 | *Orbulina universa* | 1 | 265 | 22 September |
| | 70 | *Orbulina universa* | 1 | 265 | 22 September |
| | 71 | *Orbulina universa* | 1 | 265 | 22 September |
| | 72 | *Orbulina universa* | 1 | 265 | 22 September |
| | 73 | *Orbulina universa* | 1 | 265 | 22 September |
| | 74 | *Orbulina universa* | 1 | 265 | 22 September |
| | 75 | *Orbulina universa* | 1 | 265 | 22 September |
| | 76 | *Orbulina universa* | 1 | 265 | 22 September |
| | 77 | *Orbulina universa* | 1 | 265 | 22 September |
| | 78 | *Orbulina universa* | 1 | 265 | 22 September |
| | 79 | *Globigerinita glutinata* | 1 | 265 | 22 September |
| | 80 | *Globigerinita glutinata* | 1 | 265 | 22 September |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 7 | 81 | *Globigerinita glutinata* | 5 | 265 | 22 September |
| | 82 | *Hastigerina pelagica* | 1 | 265 | 22 September |
| | 83 | *Hastigerina pelagica* | 1 | 265 | 22 September |
| | 84 | *Hastigerina pelagica* | 5 | 265 | 22 September |
| | 85 | *Globigerinella siphonifera* | 1 | 265 | 22 September |
| | 86 | *Globigerinella siphonifera* | 1 | 265 | 22 September |
| | 87 | *Globigerinella siphonifera* | 2 | 265 | 22 September |
| | 88 | *Globigerinoides ruber* (pink variety) | 1 | 265 | 22 September |
| | 89 | *Globigerinoides ruber* (pink variety) | 1 | 265 | 22 September |
| | 90 | *Globigerinoides ruber* (pink variety) | 5 | 265 | 22 September |
| | 91 | *Globigerinoides conglobatus* | 1 | 265 | 22 September |
| | 92 | *Globigerinoides conglobatus* | 1 | 265 | 22 September |
| | 93 | *Globigerinoides conglobatus* | 5 | 265 | 22 September |
| | 94 | *Globigerinoides ruber* | 1 | 265 | 22 September |
| | 95 | *Globigerinoides sacculifer* | 1 | 265 | 22 September |
| | 96 | *Globigerinoides sacculifer* | 1 | 265 | 22 September |
| | 97 | *Globigerinoides sacculifer* | 7 | 265 | 22 September |
| | 98 | *Globorotalia scitula* | 3 | 265 | 22 September |
| | 99 | *Globorotalia hirsuta* (juveniles) | 1 | 265 | 22 September |
| 8 | 102 | *Orbulina universa* | 1 | 268 | 25 September |
| | 103 | *Orbulina universa* | 1 | 268 | 25 September |
| | 104 | *Orbulina universa* | 1 | 268 | 25 September |
| | 105 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 106 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 107 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 108 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 109 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 110 | *Globigerinella siphonifera* | 1 | 268 | 25 September |
| | 111 | *Globigerinoides sacculifer* | 1 | 268 | 25 September |
| | 112 | *Globorotalia truncatulinoides* | 4 | 268 | 25 September |
| | 113 | *Tenuitella fleisheri* (?) | 3 | 268 | 25 September |
| | 114 | *Tenuitella fleisheri* (?) | 1 | 268 | 25 September |
| | 115 | *Globigerinita glutinata* | 1 | 268 | 25 September |
| | 116 | *Globigerinita glutinata* | 1 | 268 | 25 September |
| | 117 | *Globigerinita glutinata* | 1 | 268 | 25 September |
| | 118 | *Hastigerina pelagica* | 1 | 268 | 25 September |
| | 119 | *Hastigerina pelagica* | 1 | 268 | 25 September |
| | 120 | *Globigerinoides ruber* | 4 | 268 | 25 September |
| 9 | 121 | *Globigerinella siphonifera* | 1 | 269 | 26 September |
| | 122 | *Globigerinella siphonifera* | 1 | 269 | 26 September |
| | 123 | *Globigerinella siphonifera* | 1 | 269 | 26 September |
| | 124 | *Globigerinoides ruber* (pink variety) | 1 | 269 | 26 September |
| | 125 | *Globigerinoides ruber* (pink variety) | 2 | 269 | 26 September |
| | 126 | *Globorotalia scitula* (juveniles?) | 1 | 269 | 26 September |
| | 127 | *Globorotalia scitula* (juveniles?) | 2 | 269 | 26 September |
| | 128 | *Globigerinita glutinata* | 1 | 269 | 26 September |
| | 129 | *Globigerinita glutinata* | 1 | 269 | 26 September |
| | 130 | *Globorotalia truncatulinoides* | 1 | 269 | 26 September |
| | 131 | *Globigerina incompta* | 1 | 269 | 26 September |
| | 132 | *Globigerinoides sacculifer* | 1 | 269 | 26 September |
| | 133 | *Globigerinoides sacculifer* | 1 | 269 | 26 September |
| | 134 | *Hastigerina pelagica* | 1 | 269 | 26 September |
| | 135 | *Acantharea sp.* | 30 | 269 | 26 September |
| 10 | 136 | *Orbulina universa* | 1 | 270 | 27 September |
| | 137 | *Orbulina universa* | 1 | 270 | 27 September |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 10 | 138 | *Orbulina universa* | 1 | 270 | 27 September |
| | 139 | *Orbulina universa* | 10 | 270 | 27 September |
| | 140 | *Globigerinoides ruber* (pink variety?) | 1 | 270 | 27 September |
| | 141 | *Globigerinoides ruber* (pink variety?) | 1 | 270 | 27 September |
| | 142 | *Globigerinoides ruber* (pink variety?) | 1 | 270 | 27 September |
| | 143 | *Globigerinoides ruber* (pink variety?) | 1 | 270 | 27 September |
| | 144 | *Globigerinoides ruber* (pink variety?) | 1 | 270 | 27 September |
| | 145 | *Globigerinoides ruber* (pink variety?) | 10 | 270 | 27 September |
| | 146 | *Globorotalia menardii* | 1 | 270 | 27 September |
| | 147 | *Globorotalia menardii* | 1 | 270 | 27 September |
| | 148 | *Globorotalia menardii* | 5 | 270 | 27 September |
| | 149 | *Globorotalia hirsuta* | 1 | 270 | 27 September |
| | 150 | *Globigerinita glutinata* | 1 | 270 | 27 September |
| | 151 | *Globigerinita glutinata* | 1 | 270 | 27 September |
| | 152 | *Globigerinita glutinata* | 1 | 270 | 27 September |
| | 153 | *Globigerinita glutinata* | 1 | 270 | 27 September |
| | 154 | *Globigerinita glutinata* | 1 | 270 | 27 September |
| | 155 | *Globigerinita glutinata* | 13 | 270 | 27 September |
| | 156 | *Tenuitella fleisheri/parkerae* (?) | 1 | 270 | 27 September |
| | 157 | *Tenuitella fleisheri/parkerae* (?) | 1 | 270 | 27 September |
| | 158 | *Tenuitella fleisheri/parkerae* (?) | 2 | 270 | 27 September |
| | 159 | *Globigerinoides sacculifer* | 14 | 270 | 27 September |
| | 160 | *Globigerinoides sacculifer* | 1 | 270 | 27 September |
| | 161 | *Globigerinoides conglobatus* | 7 | 270 | 27 September |
| | 162 | *Globigerinoides conglobatus* | 1 | 270 | 27 September |
| | 163 | *Globigerina bulloides* | 1 | 270 | 27 September |
| | 164 | *Neogloboquadrina dutertrei* | 1 | 270 | 27 September |
| | 165 | *Neogloboquadrina dutertrei* | 1 | 270 | 27 September |
| | 166 | *Pulleniatina obliquiloculata* | 1 | 270 | 27 September |
| | 167 | *Globorotalia scitula* | 1 | 270 | 27 September |
| 11 | 168 | *Globorotalia scitula* | 1 | 271 | 28 September |
| | 169 | *Globorotalia scitula* | 1 | 271 | 28 September |
| | 170 | *Globorotalia scitula* | 1 | 271 | 28 September |
| | 171 | *Globorotalia scitula* | 5 | 271 | 28 September |
| | 172 | *Globorotalia scitula* | 10 | 271 | 28 September |
| | 173 | *Globorotalia scitula* | 30 | 271 | 28 September |
| | 174 | *Orbulina universa* | 1 | 271 | 28 September |
| | 175 | *Orbulina universa* | 1 | 271 | 28 September |
| | 176 | *Orbulina universa* | 1 | 271 | 28 September |
| | 177 | *Orbulina universa* | 1 | 271 | 28 September |
| | 178 | *Orbulina universa* | 1 | 271 | 28 September |
| | 179 | *Orbulina universa* | 1 | 271 | 28 September |
| | 180 | *Orbulina universa* | 1 | 271 | 28 September |
| | 181 | *Orbulina universa* | 1 | 271 | 28 September |
| | 182 | *Globorotalia crassaformis* | 1 | 271 | 28 September |
| | 183 | *Globorotalia inflata* | 1 | 271 | 28 September |
| | 184 | *Globorotalia inflata* | 1 | 271 | 28 September |
| | 185 | *Globorotalia inflata* | 1 | 271 | 28 September |
| | 186 | *Globorotalia inflata* | 5 | 271 | 28 September |
| | 187 | *Globorotalia inflata* | 20 | 271 | 28 September |
| | 188 | *Turborotalita quinqueloba* (?) | 1 | 271 | 28 September |
| | 189 | *Turborotalita quinqueloba* (?) | 1 | 271 | 28 September |
| | 190 | *Turborotalita quinqueloba* (?) | 1 | 271 | 28 September |
| | 191 | *Turborotalita quinqueloba* (?) | 1 | 271 | 28 September |
| | 192 | *Turborotalita quinqueloba* (?) | 6 | 271 | 28 September |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 11 | 193 | *Turborotalita quinqueloba* (?) | 25 | 271 | 28 September |
| | 194 | *Neogloboquadrina pachyderma* | 1 | 271 | 28 September |
| | 195 | *Neogloboquadrina pachyderma* | 1 | 271 | 28 September |
| | 196 | *Turborotalita humilis* | 1 | 271 | 28 September |
| | 197 | *Neogloboquadrina pachyderma* | 1 | 271 | 28 September |
| | 198 | *Neogloboquadrina pachyderma* | 1 | 271 | 28 September |
| | 199 | *Neogloboquadrina pachyderma* | 6 | 271 | 28 September |
| | 200 | *Neogloboquadrina pachyderma* | 25 | 271 | 28 September |
| | 201 | *Globigerinita uvula* | 1 | 271 | 28 September |
| | 221 | *Globigerinita glutinata* | 1 | 272 | 29 September |
| | 222 | *Globigerinita glutinata* | 3 | 272 | 29 September |
| | 223 | *Tenuitella fleisheri/quinqueloba* (?) | 9 | 272 | 29 September |
| | 224 | *Globigerinoides sacculifer* | 1 | 272 | 29 September |
| | 225 | *Globigerinoides sacculifer* | 7 | 272 | 29 September |
| | 226 | *Globigerinoides ruber* | 1 | 272 | 29 September |
| | 227 | *Globigerinoides ruber* | 8 | 272 | 29 September |
| | 228 | *Globorotalia scitula* | 7 | 272 | 29 September |
| None | 202 | *Orbulina universa* | 1 | 272 | 29 September |
| | 203 | *Orbulina universa* | 1 | 272 | 29 September |
| | 204 | *Orbulina universa* | 1 | 272 | 29 September |
| | 205 | *Orbulina universa* | 1 | 272 | 29 September |
| | 206 | *Orbulina universa* | 1 | 272 | 29 September |
| | 207 | *Globorotalia menardii* | 1 | 272 | 29 September |
| | 208 | *Globorotalia menardii* | 1 | 272 | 29 September |
| | 209 | *Neogloboquadrina dutertrei* | 1 | 272 | 29 September |
| | 210 | *Neogloboquadrina dutertrei* | 1 | 272 | 29 September |
| | 211 | *Neogloboquadrina dutertrei* | 3 | 272 | 29 September |
| | 212 | *Neogloboquadrina dutertrei* | 1 | 272 | 29 September |
| | 213 | *Hastigerina pelagica* | 1 | 272 | 29 September |
| | 214 | *Hastigerina pelagica* | 1 | 272 | 29 September |
| | 215 | *Globigerinoides sacculifer* | 1 | 272 | 29 September |
| | 216 | *Globigerinoides sacculifer* | 1 | 272 | 29 September |
| | 217 | *Globigerinoides sacculifer* | 5 | 272 | 29 September |
| | 218 | *Globigerinoides ruber* (pink variety) | 1 | 272 | 29 September |
| | 219 | *Globigerinoides ruber* (pink variety) | 1 | 272 | 29 September |
| | 220 | *Globigerinoides ruber* (pink variety) | 16 | 272 | 29 September |
| | 242 | *Pulleniatina obliquiloculata* | 1 | 273 | 30 September |
| | 243 | *Beella digitata* | 1 | 273 | 30 September |
| | 244 | *Globorotalia menardii* | 1 | 273 | 30 September |
| | 253 | *Globigerinita glutinata* | 3 | 273 | 30 September |
| 12 | 229 | *Orbulina universa* | 1 | 273 | 30 September |
| | 230 | *Orbulina universa* | 1 | 273 | 30 September |
| | 231 | *Orbulina universa* | 1 | 273 | 30 September |
| | 232 | *Orbulina universa* | 1 | 273 | 30 September |
| | 233 | *Orbulina universa* | 1 | 273 | 30 September |
| | 234 | *Orbulina universa* | 1 | 273 | 30 September |
| | 235 | *Globorotalia crassaformis* | 1 | 273 | 30 September |
| | 236 | *Globorotalia crassaformis* | 1 | 273 | 30 September |
| | 237 | *Globorotalia crassaformis* | 2 | 273 | 30 September |
| | 238 | *Globorotalia menardii* | 1 | 273 | 30 September |
| | 239 | *Globorotalia menardii* | 1 | 273 | 30 September |
| | 240 | *Globorotalia menardii* | 1 | 273 | 30 September |
| | 241 | *Neogloboquadrina dutertrei* | 1 | 273 | 30 September |
| | 245 | *Globigerinita glutinata* | 1 | 273 | 30 September |
| | 247 | *Globigerinita glutinata* | 3 | 273 | 30 September |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 12 | 248 | *Globigerinoides sacculifer* | 1 | 273 | 30 September |
| | 249 | *Globigerinoides sacculifer* | 12 | 273 | 30 September |
| | 250 | *Globigerinoides ruber* (pink variety) | 1 | 273 | 30 September |
| | 251 | *Globigerinoides ruber* (white variety) | 1 | 273 | 30 September |
| | 252 | *Globigerinoides ruber* (pink variety) | 6 | 273 | 30 September |
| | 254 | *Globigerinella siphonifera* | 1 | 273 | 30 September |
| | 255 | *Globigerina flaconensis* | 1 | 273 | 30 September |
| | 256 | *Globorotalia scitula* | 1 | 273 | 30 September |
| | 257 | *Globorotalia scitula* | 21 | 273 | 30 September |
| | 258 | *Globorotalia crassaformis* | 1 | 273 | 30 September |
| | 259 | *Globorotalia menardii* (?) | 4 | 273 | 30 September |
| 13 | 260 | *Orbulina universa* | 1 | 274 | 1 October |
| | 261 | *Orbulina universa* | 1 | 274 | 1 October |
| | 262 | *Orbulina universa* | 1 | 274 | 1 October |
| | 263 | *Orbulina universa* | 1 | 274 | 1 October |
| | 264 | *Orbulina universa* | 1 | 274 | 1 October |
| | 265 | *Orbulina universa* | 1 | 274 | 1 October |
| | 266 | *Globorotalia menardii* | 1 | 274 | 1 October |
| | 267 | *Globorotalia crassaformis* | 1 | 274 | 1 October |
| | 268 | *Neogloboquadrina dutertrei* | 1 | 274 | 1 October |
| | 269 | *Globorotalia scitula* | 1 | 274 | 1 October |
| | 270 | *Globorotalia scitula* | 1 | 274 | 1 October |
| | 271 | *Globorotalia scitula* | 1 | 274 | 1 October |
| | 272 | *Globorotalia scitula* | 17 | 274 | 1 October |
| | 273 | *Globorotalia menardii* (juveniles?) | 1 | 274 | 1 October |
| | 274 | *Globorotalia menardii* (juveniles?) | 3 | 274 | 1 October |
| | 275 | *Globorotalia crassaformis* (juveniles) | 1 | 274 | 1 October |
| | 276 | *Globigerinita glutinata* | 1 | 274 | 1 October |
| | 277 | *Globigerinita glutinata* | 1 | 274 | 1 October |
| | 278 | *Globigerinita glutinata* | 1 | 274 | 1 October |
| | 279 | *Globigerinita glutinata* | 14 | 274 | 1 October |
| | 280 | *Globigerinoides sacculifer* | 1 | 274 | 1 October |
| | 281 | *Globigerinoides sacculifer* | 20 | 274 | 1 October |
| | 282 | *Hastigerina pelagica* | 1 | 274 | 1 October |
| | 283 | *Hastigerina pelagica* | 2 | 274 | 1 October |
| | 284 | *Globigerinoides ruber* (pink variety?) | 1 | 274 | 1 October |
| | 285 | *Globigerinoides ruber* (white variety) | 8 | 274 | 1 October |
| | 286 | *Globigerinella siphonifera* | 1 | 274 | 1 October |
| | 287 | *Globigerinella siphonifera* | 1 | 274 | 1 October |
| | 288 | *Globigerinella siphonifera* | 1 | 274 | 1 October |
| | 289 | *Globigerinita uvula* | 1 | 274 | 1 October |
| 14 | 290 | *Orbulina universa* | 1 | 275 | 2 October |
| | 291 | *Orbulina universa* | 1 | 275 | 2 October |
| | 292 | *Orbulina universa* | 1 | 275 | 2 October |
| | 293 | *Orbulina universa* | 1 | 275 | 2 October |
| | 294 | *Orbulina universa* | 1 | 275 | 2 October |
| | 295 | *Orbulina universa* | 1 | 275 | 2 October |
| | 296 | *Pulleniatina obliquiloculata* | 1 | 275 | 2 October |
| | 297 | *Pulleniatina obliquiloculata* | 1 | 275 | 2 October |
| | 298 | *Pulleniatina obliquiloculata* | 1 | 275 | 2 October |
| | 299 | *Candeina nitida* | 1 | 275 | 2 October |
| | 300 | *Globorotalia menardii* | 1 | 275 | 2 October |
| | 301 | *Globorotalia menardii* | 1 | 275 | 2 October |
| | 302 | *Globorotalia menardii* | 3 | 275 | 2 October |
| | 303 | *Globorotalia menardii* | 1 | 275 | 2 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 14 | 304 | *Globorotalia menardii* | 6 | 275 | 2 October |
| | 305 | *Globorotalia scitula* | 1 | 275 | 2 October |
| | 306 | *Globorotalia scitula* | 6 | 275 | 2 October |
| | 307 | *Neogloboquadrina dutertrei* | 1 | 275 | 2 October |
| | 308 | *Neogloboquadrina dutertrei* | 1 | 275 | 2 October |
| | 309 | *Neogloboquadrina dutertrei* | 1 | 275 | 2 October |
| | 310 | *Neogloboquadrina dutertrei* | 8 | 275 | 2 October |
| | 311 | *Globigerinoides sacculifer* | 1 | 275 | 2 October |
| | 312 | *Globigerinoides sacculifer* | 1 | 275 | 2 October |
| | 313 | *Globigerinoides sacculifer* | 5 | 275 | 2 October |
| | 314 | *Globigerinoides ruber* (white variety) | 2 | 275 | 2 October |
| | 315 | *Globigerinoides ruber* (pink variety) | 1 | 275 | 2 October |
| | 316 | *Globigerinoides ruber* (pink variety) | 8 | 275 | 2 October |
| | 317 | *Globigerinita glutinata* | 1 | 275 | 2 October |
| | 318 | *Globigerinita glutinata* | 1 | 275 | 2 October |
| | 319 | *Globigerinita glutinata* | 13 | 275 | 2 October |
| | 320 | *Candeina nitida* | 1 | 275 | 2 October |
| | 321 | *Globigerinella siphonifera* | 1 | 275 | 2 October |
| | 322 | *Globigerinella siphonifera* | 8 | 275 | 2 October |
| | 323 | *Globigerinella siphonifera* | 1 | 275 | 2 October |
| | 324 | *Globigerinella calida* (?) | 1 | 275 | 2 October |
| 15 | 325 | *Orbulina universa* | 1 | 276 | 3 October |
| | 326 | *Orbulina universa* | 1 | 276 | 3 October |
| | 327 | *Orbulina universa* | 1 | 276 | 3 October |
| | 328 | *Orbulina universa* | 1 | 276 | 3 October |
| | 329 | *Orbulina universa* | 1 | 276 | 3 October |
| | 330 | *Orbulina universa* | 1 | 276 | 3 October |
| | 331 | *Pulleniatina obliquiloculata* | 2 | 276 | 3 October |
| | 338 | *Globorotalia menardii* | 1 | 277 | 4 October |
| | 339 | *Globorotalia menardii* | 1 | 277 | 4 October |
| | 340 | *Globorotalia menardii* | 1 | 277 | 4 October |
| | 341 | *Globorotalia menardii* | 16 | 277 | 4 October |
| 16 | 332 | *Orbulina universa* | 1 | 277 | 4 October |
| | 333 | *Orbulina universa* | 1 | 277 | 4 October |
| | 334 | *Orbulina universa* | 1 | 277 | 4 October |
| | 335 | *Orbulina universa* | 1 | 277 | 4 October |
| | 336 | *Orbulina universa* | 1 | 277 | 4 October |
| | 337 | *Orbulina universa* | 1 | 277 | 4 October |
| | 337 | *Orbulina universa* | 31 | 277 | 4 October |
| | 342 | *Pulleniatina obliquiloculata* | 1 | 277 | 4 October |
| | 343 | *Pulleniatina obliquiloculata* | 1 | 277 | 4 October |
| | 344 | *Pulleniatina obliquiloculata* | 1 | 277 | 4 October |
| | 345 | *Pulleniatina obliquiloculata* | 1 | 277 | 4 October |
| | 346 | *Pulleniatina obliquiloculata* | 6 | 277 | 4 October |
| | 347 | *Globigerinella siphonifera* | 1 | 277 | 4 October |
| | 348 | *Globigerinella siphonifera* | 1 | 277 | 4 October |
| | 349 | *Globigerinella siphonifera* | 1 | 277 | 4 October |
| | 350 | *Globigerinella siphonifera* | 20 | 277 | 4 October |
| | 351 | *Globigerinoides sacculifer* | 1 | 277 | 4 October |
| | 352 | *Globigerinoides sacculifer* | 1 | 277 | 4 October |
| | 353 | *Globigerinoides sacculifer* | 1 | 277 | 4 October |
| | 354 | *Globigerinoides sacculifer* | 20 | 277 | 4 October |
| | 355 | *Globigerinoides conglobatus* | 1 | 277 | 4 October |
| | 356 | *Globigerinoides ruber* (white variety) | 1 | 277 | 4 October |
| | 357 | *Globigerinoides ruber* (white variety) | 6 | 277 | 4 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 16 | 358 | *Globigerinoides ruber* (pink variety) | 1 | 277 | 4 October |
| | 359 | *Globigerinoides ruber* (pink variety) | 10 | 277 | 4 October |
| | 360 | *Globorotalia tumida* (?) | 1 | 277 | 4 October |
| | 361 | *Globorotalia tumida/menardii* (?) | 1 | 277 | 4 October |
| | 362 | *Globorotalia menardii* (some tumida?) | 12 | 277 | 4 October |
| | 397 | *Globigerinita glutinata* | 3 | 279 | 6 October |
| | 398 | *Pulleniatina obliquiloculata* | 3 | 279 | 6 October |
| 17 | 363 | *Orbulina universa* | 1 | 278 | 5 October |
| | 364 | *Globigerinella siphonifera* | 1 | 278 | 5 October |
| | 365 | *Globigerinella siphonifera* | 6 | 278 | 5 October |
| | 366 | *Globigerinella siphonifera* | 1 | 278 | 5 October |
| | 367 | *Globigerinella siphonifera* | 11 | 278 | 5 October |
| | 368 | *Globigerinella calida* (?) | 1 | 278 | 5 October |
| | 369 | *Globigerinoides sacculifer* | 1 | 278 | 5 October |
| | 370 | *Globigerinoides sacculifer* | 1 | 278 | 5 October |
| | 371 | *Globigerinoides sacculifer* | 16 | 278 | 5 October |
| | 372 | *Globigerinoides ruber* (white variety) | 1 | 278 | 5 October |
| | 373 | *Globigerinoides ruber* (white variety) | 9 | 278 | 5 October |
| | 374 | *Globigerinoides ruber* (pink variety) | 2 | 278 | 5 October |
| | 375 | *Neogloboquadrina dutertrei* | 1 | 278 | 5 October |
| | 376 | *Globorotalia menardii* | 1 | 278 | 5 October |
| | 377 | *Globorotalia menardii* | 7 | 278 | 5 October |
| 18 | 378 | *Orbulina universa* | 1 | 279 | 6 October |
| | 379 | *Orbulina universa* | 1 | 279 | 6 October |
| | 380 | *Orbulina universa* | 1 | 279 | 6 October |
| | 381 | *Orbulina universa* | 1 | 279 | 6 October |
| | 382 | *Orbulina universa* | 1 | 279 | 6 October |
| | 383 | *Hastigerina pelagica* | 1 | 279 | 6 October |
| | 384 | *Hastigerina pelagica* | 1 | 279 | 6 October |
| | 385 | *Hastigerina pelagica* | 3 | 279 | 6 October |
| | 386 | *Globigerinoides sacculifer* | 1 | 279 | 6 October |
| | 387 | *Globigerinoides sacculifer* | 1 | 279 | 6 October |
| | 388 | *Globigerinoides sacculifer* | 10 | 279 | 6 October |
| | 389 | *Globigerinella siphonifera* | 1 | 279 | 6 October |
| | 390 | *Globigerinella siphonifera* | 1 | 279 | 6 October |
| | 391 | *Globigerinella siphonifera* | 12 | 279 | 6 October |
| | 392 | *Globigerinoides ruber* (white variety) | 7 | 279 | 6 October |
| | 393 | *Globigerinoides ruber* (pink variety) | 1 | 279 | 6 October |
| | 394 | *Globigerinoides ruber* (pink variety) | 2 | 279 | 6 October |
| | 395 | *Globigerinita glutinata* | 1 | 279 | 6 October |
| | 396 | *Globorotalia menardii* | 5 | 279 | 6 October |
| 19 | 399 | *Orbulina universa* | 1 | 279 | 6 October |
| | 400 | *Hastigerina pelagica* | 1 | 280 | 7 October |
| | 401 | *Hastigerina pelagica* | 1 | 280 | 7 October |
| | 402 | *Globigerinoides sacculifer* | 1 | 280 | 7 October |
| | 403 | *Globigerinoides sacculifer* | 1 | 280 | 7 October |
| | 404 | *Globigerinoides sacculifer* | 20 | 280 | 7 October |
| | 405 | *Globigerinita glutinata* | 2 | 280 | 7 October |
| | 406 | *Globigerinita glutinata* | 6 | 280 | 7 October |
| | 407 | *Globigerinita glutinata* (?) | 1 | 280 | 7 October |
| | 408 | *Globorotalia menardii* | 3 | 280 | 7 October |
| | 409 | *Globorotalia truncatulinoides* | 1 | 280 | 7 October |
| | 410 | *Globigerinoides ruber* (white variety) | 1 | 280 | 7 October |
| | 411 | *Globigerinoides ruber* (white variety) | 21 | 280 | 7 October |
| | 412 | *Globigerinoides ruber* (pink variety) | 1 | 280 | 7 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 19 | 413 | *Globigerinoides ruber* (pink variety) | 11 | 280 | 7 October |
| | 414 | *Globigerinella siphonifera* | 1 | 280 | 7 October |
| | 415 | *Globigerinella siphonifera* | 6 | 280 | 7 October |
| | 416 | *Neogloboquadrina dutertrei* | 1 | 280 | 7 October |
| | 417 | *Pulleniatina obliquiloculata/dutertrei* (?) | 1 | 280 | 7 October |
| 20 | 418 | *Orbulina universa* | 1 | 281 | 8 October |
| | 419 | *Orbulina universa* | 1 | 281 | 8 October |
| | 420 | *Orbulina universa* | 1 | 281 | 8 October |
| | 421 | *Orbulina universa* | 1 | 281 | 8 October |
| | 422 | *Orbulina universa* | 1 | 281 | 8 October |
| | 423 | *Globorotalia truncatulinoides* | 1 | 281 | 8 October |
| | 424 | *Globorotalia truncatulinoides* | 1 | 281 | 8 October |
| | 425 | *Globorotalia truncatulinoides* | 5 | 281 | 8 October |
| | 426 | *Globorotalia truncatulinoides* | 1 | 281 | 8 October |
| | 427 | *Globigerinoides ruber* (pink variety) | 1 | 281 | 8 October |
| | 428 | *Globigerinoides ruber* (pink variety) | 10 | 281 | 8 October |
| | 429 | *Globigerinoides ruber* (white variety) | 1 | 281 | 8 October |
| | 430 | *Globigerinoides ruber* (white variety) | 11 | 281 | 8 October |
| | 431 | *Globigerinoides sacculifer* | 1 | 281 | 8 October |
| | 432 | *Globigerinoides sacculifer* | 6 | 281 | 8 October |
| | 433 | *Hastigerina pelagica* | 3 | 281 | 8 October |
| | 434 | *Globigerinella calida* (?) | 1 | 281 | 8 October |
| | 435 | *Globigerinella calida* (?) | 3 | 281 | 8 October |
| | 436 | *Globigerinita glutinata* | 1 | 281 | 8 October |
| | 437 | *Globigerinita glutinata* | 9 | 281 | 8 October |
| 21 | 438 | *Orbulina universa* | 1 | 282 | 9 October |
| | 439 | *Orbulina universa* | 1 | 282 | 9 October |
| | 440 | *Orbulina universa* | 1 | 282 | 9 October |
| | 441 | *Orbulina universa* | 1 | 282 | 9 October |
| | 442 | *Orbulina universa* | 1 | 282 | 9 October |
| | 443 | *Globorotalia truncatulinoides* | 1 | 282 | 9 October |
| | 444 | *Globorotalia truncatulinoides* | 1 | 282 | 9 October |
| | 445 | *Globorotalia truncatulinoides* | 4 | 282 | 9 October |
| | 446 | *Globigerinella siphonifera* | 1 | 282 | 9 October |
| | 447 | *Globigerinella calida* (?) | 1 | 282 | 9 October |
| | 448 | *Globigerinella calida* (?) | 1 | 282 | 9 October |
| | 449 | *Globigerinella calida* (?) | 6 | 282 | 9 October |
| | 450 | *Hastigerina pelagica* | 1 | 282 | 9 October |
| | 451 | *Globigerinoides sacculifer* | 1 | 282 | 9 October |
| | 452 | *Globigerinoides sacculifer* | 11 | 282 | 9 October |
| | 453 | *Globigerinoides ruber* (pink variety) | 5 | 282 | 9 October |
| | 454 | *Globigerinoides ruber* (white variety) | 1 | 282 | 9 October |
| | 455 | *Globigerinoides ruber* (white variety) | 12 | 282 | 9 October |
| | 456 | *Globigerinita glutinata* | 3 | 282 | 9 October |
| | 457 | *Globorotalia hirsuta* | 1 | 282 | 9 October |
| | 458 | *Globorotalia ungulata* | 1 | 282 | 9 October |
| | 459 | *Globorotalia tumida* (?) | 1 | 282 | 9 October |
| | 460 | *Globorotalia menardii* | 1 | 282 | 9 October |
| | 461 | *Globorotalia tumida/menardii* (?) | 1 | 282 | 9 October |
| | 462 | *Globorotalia tumida* (?) | 5 | 282 | 9 October |
| | 525 | *Globorotalia menardii* | 6 | 285 | 12 October |
| 22 | 463 | *Orbulina universa* | 1 | 283 | 10 October |
| | 464 | *Orbulina universa* | 1 | 283 | 10 October |
| | 465 | *Orbulina universa* | 1 | 283 | 10 October |
| | 466 | *Neogloboquadrina dutertrei* | 1 | 283 | 10 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 22 | 467 | *Neogloboquadrina dutertrei* | 1 | 283 | 10 October |
| | 468 | *Neogloboquadrina dutertrei* | 7 | 283 | 10 October |
| | 469 | *Globigerinita glutinata* | 1 | 283 | 10 October |
| | 470 | *Globigerinita glutinata* | 1 | 283 | 10 October |
| | 471 | *Globigerinita glutinata* | 1 | 283 | 10 October |
| | 472 | *Globigerinita glutinata* | 10 | 283 | 10 October |
| | 473 | *Globigerinita glutinata* | 30 | 283 | 10 October |
| | 474 | *Pulleniatina obliquiloculata* | 1 | 283 | 10 October |
| | 475 | *Globorotalia crassaformis* | 1 | 283 | 10 October |
| | 476 | *Globorotalia crassaformis* (?) | 1 | 283 | 10 October |
| | 477 | *Globorotalia hirsuta* | 1 | 283 | 10 October |
| | 478 | *Globorotalia hirsuta* | 4 | 283 | 10 October |
| | 479 | *Globorotalia truncatulinoides* | 1 | 283 | 10 October |
| | 480 | *Globorotalia truncatulinoides* | 3 | 283 | 10 October |
| | 481 | *Globorotalia hirsuta* | 1 | 283 | 10 October |
| | 482 | *Globorotalia truncatulinoides* | 1 | 283 | 10 October |
| | 483 | *Globorotalia truncatulinoides* | 3 | 283 | 10 October |
| | 484 | *Turborotalita humilis* (?) | 1 | 283 | 10 October |
| | 485 | *Turborotalita humilis* (?) | 1 | 283 | 10 October |
| | 486 | *Turborotalita humilis* (?) | 10 | 283 | 10 October |
| | 487 | *Tenuitella fleisheri* | 15 | 283 | 10 October |
| | 488 | *Globigerinoides sacculifer* | 8 | 283 | 10 October |
| | 489 | *Globigerinoides ruber* (white variety) | 10 | 283 | 10 October |
| | 490 | *Globigerinella siphonifera* | 4 | 283 | 10 October |
| | 491 | *Globorotalia menardii* | 1 | 283 | 10 October |
| | 526 | *Neogloboquadrina dutertrei* | 10 | 285 | 12 October |
| | 527 | *Globorotalia ungulata* | 1 | 285 | 12 October |
| | 528 | *Globorotalia tumida* (?) | 1 | 285 | 12 October |
| | 529 | *Globorotalia menardii* | 1 | 285 | 12 October |
| 23 | 492 | *Orbulina universa* | 1 | 284 | 11 October |
| | 493 | *Orbulina universa* | 1 | 284 | 11 October |
| | 494 | *Orbulina universa* | 1 | 284 | 11 October |
| | 495 | *Orbulina universa* | 1 | 284 | 11 October |
| | 496 | *Globorotalia inflata* | 1 | 284 | 11 October |
| | 497 | *Globorotalia inflata* | 1 | 284 | 11 October |
| | 498 | *Globorotalia inflata* | 5 | 284 | 11 October |
| | 499 | *Globorotalia truncatulinoides* | 1 | 284 | 11 October |
| | 500 | *Globorotalia truncatulinoides* | 6 | 284 | 11 October |
| | 501 | *Globorotalia truncatulinoides* | 1 | 284 | 11 October |
| | 502 | *Globorotalia truncatulinoides* | 15 | 284 | 11 October |
| | 503 | *Globorotalia hirsuta* | 1 | 284 | 11 October |
| | 504 | *Globorotalia hirsuta* | 1 | 284 | 11 October |
| | 505 | *Globorotalia hirsuta* | 3 | 284 | 11 October |
| | 506 | *Globorotalia hirsuta* | 10 | 284 | 11 October |
| | 507 | *Globigerinella siphonifera* | 1 | 284 | 11 October |
| | 508 | *Globigerinella siphonifera* | 1 | 284 | 11 October |
| | 509 | *Globigerinella siphonifera* | 3 | 284 | 11 October |
| | 510 | *Globigerinella siphonifera* | 10 | 284 | 11 October |
| | 511 | *Neogloboquadrina dutertrei* | 1 | 284 | 11 October |
| | 512 | *Neogloboquadrina dutertrei* | 4 | 284 | 11 October |
| | 513 | *Globorotalia menardii* | 1 | 284 | 11 October |
| | 514 | *Globorotalia tumida* (?) | 1 | 284 | 11 October |
| | 515 | *Globigerinoides sacculifer* | 1 | 284 | 11 October |
| | 516 | *Globigerinoides sacculifer* | 10 | 284 | 11 October |
| | 517 | *Globigerinoides ruber* (white variety) | 9 | 284 | 11 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 23 | 518 | *Hastigerina pelagica* | 1 | 284 | 11 October |
| | 519 | *Globigerina bulloides* | 1 | 284 | 11 October |
| | 520 | *Globigerina bulloides* | 9 | 284 | 11 October |
| | 521 | *Globorotalia scitula* | 8 | 284 | 11 October |
| | 522 | *Globigerinita glutinata* | 8 | 285 | 12 October |
| | 523 | *Globigerina bulloides* (?) | 2 | 285 | 12 October |
| | 524 | *Neogloboquadrina pachyderma* | 2 | 285 | 12 October |
| 24 | 530 | *Globigerina bulloides* | 1 | 285 | 12 October |
| | 531 | *Globigerina bulloides* | 10 | 285 | 12 October |
| | 532 | *Globigerina bulloides* | 1 | 285 | 12 October |
| | 533 | *Globigerinoides sacculifer* | 1 | 285 | 12 October |
| | 534 | *Globigerinoides sacculifer* | 6 | 285 | 12 October |
| | 535 | *Globigerinoides ruber* (white variety) | 1 | 285 | 12 October |
| | 536 | *Globigerinoides ruber* (white variety) | 3 | 285 | 12 October |
| | 537 | *Globigerinoides ruber* (white variety) | 14 | 285 | 12 October |
| | 538 | *Globorotalia truncatulinoides* | 2 | 285 | 12 October |
| | 539 | *Globorotalia truncatulinoides* | 4 | 285 | 12 October |
| | 540 | *Neogloboquadrina dutertrei* | 1 | 285 | 12 October |
| | 541 | *Neogloboquadrina dutertrei* | 1 | 285 | 12 October |
| | 542 | *Neogloboquadrina dutertrei* | 5 | 285 | 12 October |
| | 543 | *Globorotalia inflata* | 1 | 286 | 13 October |
| | 544 | *Globorotalia inflata* | 2 | 286 | 13 October |
| | 545 | *Globorotalia inflata* | 1 | 286 | 13 October |
| | 546 | *Globorotalia inflata* | 5 | 286 | 13 October |
| | 547 | *Globorotalia menardii* | 2 | 286 | 13 October |
| | 548 | *Globorotalia hirsuta* | 1 | 286 | 13 October |
| | 549 | *Globorotalia hirsuta* | 5 | 286 | 13 October |
| | 550 | *Globigerinita uvula* | 1 | 286 | 13 October |
| 25 | 551 | *Globorotalia hirsuta* | 1 | 286 | 13 October |
| | 552 | *Globorotalia hirsuta* | 5 | 286 | 13 October |
| | 553 | *Globorotalia hirsuta* | 25 | 286 | 13 October |
| | 554 | *Globorotalia hirsuta* | 1 | 286 | 13 October |
| | 555 | *Globorotalia hirsuta* | 2 | 286 | 13 October |
| | 556 | *Globigerina bulloides* | 1 | 286 | 13 October |
| | 557 | *Globigerina bulloides* | 5 | 286 | 13 October |
| | 558 | *Globigerina bulloides* | 20 | 286 | 13 October |
| | 559 | *Globigerina bulloides* | 1 | 286 | 13 October |
| | 560 | *Globigerina bulloides* | 1 | 286 | 13 October |
| | 561 | *Globigerina bulloides* | 10 | 286 | 13 October |
| | 562 | *Globigerinella siphonifera* | 1 | 286 | 13 October |
| | 563 | *Globigerinella siphonifera* | 1 | 286 | 13 October |
| | 564 | *Globigerinella siphonifera* | 6 | 286 | 13 October |
| | 565 | *Globorotalia inflata* | 1 | 286 | 13 October |
| | 566 | *Globorotalia inflata* | 1 | 286 | 13 October |
| | 567 | *Globorotalia inflata* | 5 | 286 | 13 October |
| | 568 | *Globigerinita glutinata* | 9 | 287 | 14 October |
| | 569 | *Turborotalita quinqueloba* | 1 | 287 | 14 October |
| | 570 | *Turborotalita quinqueloba* | 11 | 287 | 14 October |
| 26 | 571 | *Globorotalia hirsuta* | 1 | 287 | 14 October |
| | 572 | *Globorotalia hirsuta* | 2 | 287 | 14 October |
| | 573 | *Globigerina bulloides* | 1 | 287 | 14 October |
| | 574 | *Globigerina bulloides* | 1 | 287 | 14 October |
| | 575 | *Globigerina bulloides* | 1 | 287 | 14 October |
| | 576 | *Globigerina bulloides* | 13 | 287 | 14 October |
| | 577 | *Globigerina bulloides* | 1 | 287 | 14 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 26 | 578 | *Globigerina bulloides* | 1 | 287 | 14 October |
| | 579 | *Globigerina bulloides* | 1 | 287 | 14 October |
| | 580 | *Globigerina bulloides* | 10 | 287 | 14 October |
| | 581 | *Globorotalia inflata* | 1 | 287 | 14 October |
| | 582 | *Globorotalia inflata* | 1 | 287 | 14 October |
| | 583 | *Globorotalia inflata* | 1 | 287 | 14 October |
| | 584 | *Globorotalia inflata* | 1 | 287 | 14 October |
| | 585 | *Globorotalia inflata* | 13 | 287 | 14 October |
| | 586 | *Globorotalia truncatulinoides* | 1 | 287 | 14 October |
| | 587 | *Globorotalia truncatulinoides* | 1 | 287 | 14 October |
| | 588 | *Globorotalia truncatulinoides* | 1 | 287 | 14 October |
| | 589 | *Globorotalia truncatulinoides* | 13 | 287 | 14 October |
| | 590 | *Turborotalita quinqueloba* | 1 | 287 | 14 October |
| | 591 | *Turborotalita quinqueloba* | 1 | 287 | 14 October |
| | 592 | *Turborotalita quinqueloba* | 1 | 287 | 14 October |
| | 593 | *Turborotalita quinqueloba* | 3 | 287 | 14 October |
| | 594 | *Turborotalita quinqueloba* | 25 | 287 | 14 October |
| 28 | 595 | *Globorotalia inflata* | 1 | 288 | 15 October |
| | 596 | *Globorotalia truncatulinoides* | 1 | 288 | 15 October |
| | 597 | *Globorotalia truncatulinoides* | 1 | 288 | 15 October |
| | 598 | *Globorotalia truncatulinoides* | 1 | 288 | 15 October |
| | 599 | *Globorotalia truncatulinoides* | 12 | 288 | 15 October |
| | 600 | *Globigerina bulloides* | 1 | 288 | 15 October |
| | 601 | *Globigerina bulloides* | 1 | 288 | 15 October |
| | 602 | *Globigerina bulloides* | 1 | 288 | 15 October |
| | 603 | *Globigerina bulloides* | 3 | 288 | 15 October |
| | 604 | *Globigerina bulloides* | 12 | 288 | 15 October |
| | 605 | *Globorotalia inflata* | 1 | 288 | 15 October |
| | 606 | *Globorotalia inflata* | 1 | 288 | 15 October |
| | 607 | *Globorotalia inflata* | 1 | 288 | 15 October |
| | 608 | *Globorotalia inflata* | 3 | 288 | 15 October |
| | 609 | *Globorotalia inflata* | 18 | 288 | 15 October |
| | 610 | *Neogloboquadrina dutertrei* (?) | 1 | 288 | 15 October |
| | 611 | *Neogloboquadrina dutertrei* (?) | 8 | 288 | 15 October |
| | 612 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 613 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 614 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 615 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 616 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 617 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 618 | *Turborotalita quinqueloba* | 5 | 289 | 16 October |
| | 619 | *Turborotalita quinqueloba* | 15 | 289 | 16 October |
| | 620 | *Turborotalita quinqueloba* | 17 | 289 | 16 October |
| | 632 | *Globigerinita glutinata* (?) | 2 | 289 | 16 October |
| | 633 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 634 | *Turborotalita quinqueloba* | 1 | 289 | 16 October |
| | 635 | *Turborotalita quinqueloba* | 30 | 289 | 16 October |
| 30 | 621 | *Globorotalia truncatulinoides* | 1 | 289 | 16 October |
| | 622 | *Globorotalia truncatulinoides* | 1 | 289 | 16 October |
| | 623 | *Globorotalia truncatulinoides* | 1 | 289 | 16 October |
| | 624 | *Globorotalia truncatulinoides* | 11 | 289 | 16 October |
| | 625 | *Globorotalia hirsuta* | 1 | 289 | 16 October |
| | 626 | *Globorotalia inflata* | 1 | 289 | 16 October |
| | 627 | *Globorotalia inflata* | 1 | 289 | 16 October |

**Table O1. (cont.)** A summary of the DNA Extractions in DOC Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *No.* | *SDY* | *Date* |
|---|---|---|---|---|---|
| 30 | 628 | *Globorotalia inflata* | 10 | 289 | 16 October |
| | 629 | *Globigerina bulloides* | 1 | 289 | 16 October |
| | 630 | *Globigerina bulloides* | 1 | 289 | 16 October |
| | 631 | *Globigerina bulloides* | 8 | 289 | 16 October |

**Table O2.** A summary of the DNA Extractions in Guanidinium Buffer Log for AMT-5. All times are in GMT.

| *CTD No.* | *DNA No.* | *Genus and Species* | *SDY* | *Date* |
|---|---|---|---|---|
| 2 | 1– 8 | *Orbulina universa* | 260 | 17 September |
| 3 | 9– 17 | *Orbulina universa* | 261 | 18 September |
| | 18– 22 | *Orbulina universa* | 261 | 18 September |
| 4 | 23– 44 | *Orbulina universa* | 262 | 19 September |
| | 45– 64 | *Globigerinoides sacculifer* | | |
| 5 | 65– 67 | *Orbulina universa* | 263 | 20 September |
| 6 | 68– 85 | *Orbulina universa* | 264 | 21 September |
| | 86–100 | *Globigerinoides sacculifer* | | |
| 7 | 101–112 | *Orbulina universa* | 265 | 22 September |
| 8 | 113–116 | *Orbulina universa* | 268 | 25 September |
| | 117–131 | *Globigerinella siphonifera* | | |
| 10 | 132–149 | *Orbulina universa* | 270 | 27 September |
| | 150–164 | *Globigerinoides ruber* | | |
| None | 165–168 | *Orbulina universa* | 272 | 29 September |
| 12 | 169–184 | *Orbulina universa* | 273 | 30 September |
| 13 | 185–199 | *Orbulina universa* | 274 | 1 October |
| 14 | 200–214 | *Orbulina universa* | 275 | 2 October |
| 15 | 215–228 | *Orbulina universa* | 276 | 3 October |
| 16 | 229–250 | *Orbulina universa* | 277 | 4 October |
| 18 | 251 | *Orbulina universa* | 279 | 6 October |
| 20 | 252–267 | *Orbulina universa* | 281 | 8 October |
| 21 | 268–276 | *Orbulina universa* | 282 | 9 October |
| | 299 | *Orbulina universa* | 282 | 9 October |
| 22 | 277–287 | *Orbulina universa* | 283 | 10 October |
| | 288–290 | *Globigerinoides sacculifer* | | |
| | 291–298 | *Globigerinoides ruber* | | |
| 23 | 301–315 | *Orbulina universa* | 284 | 11 October |
| 24 | 316–318 | *Orbulina universa* | 285 | 12 October |
| 25 | 319 | *Orbulina universa* | 286 | 13 October |
| | 320 | *Globorotalia truncatulinoides* | | |
| 26 | 340–360 | *Globorotalia truncatulinoides* | 289 | 16 October |

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## Glossary

| | |
|---|---|
| A/D | Analog-to-Digital |
| ADCP | Acoustic Doppler Current Profiler |
| AMT | Atlantic Meridional Transect |
| AMT-5 | The Fifth AMT Cruise |
| AOT | Aerosol Optical Thickness |
| ASCII | American Standard Code for Information Interchange |
| ATSR | Along-Track Scanning Radiometer |
| AVHRR | Advanced Very High Resolution Radiometer |
| BAS | British Antarctic Survey |
| BSST | Bulk Sea Surface Temperature |
| C-FALLS | Software package for logging SeaFALLS data. |
| C-OPS | Combined Operations |
| CANIGO | Canary Islands, Azores, Gibraltar Observations |
| CCAR | Colorado Center for Astrodynamics Research |
| CCD | Charge-Coupled Device |
| CCMS | Centre for Coastal and Marine Studies |
| CCN | Cloud Condensation Nucleii |
| CHN | Carbon-Hydrogen-Nitrogen |
| COTS | Commercial Off-The-Shelf |
| CT | Conductivity and Temperature |
| CTD | Conductivity, Temperature, and Depth |
| DC | Direct Current |
| DCM | Deep Chlorophyll Maximum |
| DMA | Dimethylamine |
| DMS | Dimethylsulfide |
| DMSP | Dimethylsulphoniopropionate |
| DMSPd | Dissolved DMSP |
| DMSPp | DMSP within phytoplankton cells |
| DNA | Deoxyribonucleic Acid |
| DOC | Dissolved Organic Carbon |
| DUT | Device Under Test |
| DVM | Digital Voltmeter |
| EDTA | Ethylenediaminetetraacetic Acid |
| EEZ | Exclusive Economic Zone |
| e-mail | Electronic Mail |
| ERS-2 | The Second Earth Resources Satellite |
| EU | European Union |
| EUC | Equatorial Under Current |
| FIGD-IC | Flow Injection Gas-Diffusion Coupled to Ion Chromatography |
| FRRF | Fast Repetition Rate Fluorometer |
| GF/F | Not an acronym, but a specific type of glass fiber filter manufactured by Whatman. |
| GMT | Greenwich Mean Time |
| GOES-8 | The Eighth Geostationary Operational Environmental Satellite |
| GPIB | General Purpose Interface Bus |
| GSFC | Goddard Space Flight Center |
| HPLC | High Performance Liquid Chromatography |
| HTCO | High Temperature Catalytic Oxidation |
| IDL | Interactive Data Language |
| IOS | (SOC) Institute of Oceanographic Sciences |
| JCR | (RRS) *James Clark Ross* |
| LoCNESS | Low-Cost NASA Environmental Sampling System |
| MA | Methylamine |
| METEOSAT | Meteorological Satellite |
| MMA | Monomethylamine |
| MODIS | Moderate Resolution Imaging Spectroradiometer |
| MVDS | Multichannel Visible Detector System |
| NASA | National Aeronautics and Space Administration |
| NEC | North Equatorial Current |
| NECC | North Equatorial Counter Current |
| NEUC | North Equatorial Undercurrent |
| NIST | National Institute of Standards and Technology |
| NOAA | National Oceanic and Atmospheric Administration |

OCI Ocean Color Irradiance
OCR Ocean Color Radiance
OPC Optical Plankton Counter

P-I Photosynthesis-Irradiance
PAR Photosynthetically Available Radiation
PC Personal Computer
PCR Polymerase Chain Reaction
PML Plymouth Marine Laboratory
POC Particulate Organic Carbon
PRIME Plankton Reactivity in the Marine Environment
PRT Platinum Resistance Temperature (sensor)
PSU Practical Salinity Units
PTFE Polyfluorotetraethylene
PVC Polyvinylchloride

RAM Random Access Memory
ROSSA Radiometric Observations of the Sea Surface and Atmosphere
RRS Royal Research Ship
RSG (PML) Remote Sensing Group
RSMAS Rosenstiel School for Marine and Atmospheric Science
RVS (BAS) Research Vessel Services

S/N Serial Number
SACZ Sub-Antarctic Convergence Zone
SBE Sea-Bird Electronics
SDY Sequential Day of the Year
SeaACE SeaWiFS Atlantic Characterization Experiment
SeaBOSS SeaWiFS Buoyant Optical Surface Sensor
SeaFALLS SeaWiFS Free-Falling Advanced Light Level Sensors
SeaOPS SeaWiFS Optical Profiling System
SeaSURF SeaWiFS Square Underwater Reference Frame
SeaWiFS Sea-viewing Wide Field-of-view Sensor
SEC South Equatorial Current
SEM Scanning Electronic Microscopy
SEUC South Equatorial Undercurrent
SMSR SeaWiFS Multichannel Surface Reference
SOC Southampton Oceanography Centre
SOMARE Sampling, Observations and Modelling of Atlantic Regional Ecosystems
SOSSTR Ship of Opportunity Sea Surface Temperature Radiometer
SPMR SeaWiFS Profiling Multichannel Radiometer
SQM SeaWiFS Quality Monitor
SSH Sea Surface Height
SSM/I Special Sensor for Microwave/Imaging
SSST Sea Surface Skin Temperature

TMA Trimethylamine
TOC Total Organic Carbon
TOPEX Topography Experiment
TSG Thermosalinograph

UIC Underway Instrumentation and Control
UK United Kingdom
UOR Undulating Oceanographic Recorder

WOCE World Ocean Circulation Experiment

XBT Expendable Bathythermograph
XOTD Expendable Optical, Temperature, and Depth

## Symbols

$A$ Air mass.
$a_O^*$ The spectral absorption coefficient for ozone.
$\hat{C}$ The retrieved (remote sensing) chlorophyll concentration.
$\tilde{C}$ The measured (*in situ*) chlorophyll concentration.
$C_O$ The atmospheric ozone concentration.
$C_0, C_1, C_2, C_3$ Polynomial coefficients.
$E(\lambda)$ The solar irradiance.
$E_0(\lambda)$ The extraterrestrial solar irradiance.
$E_d(z,\lambda)$ The spectral downwelling irradiance as a function of depth.
$E_d(0^-,\lambda)$ The spectral downwelling irradiance measured just below the sea surface.
$E_s(0^+,\lambda)$ The solar irradiance measured just above the sea surface.
$E_u(z,\lambda)$ The spectral upwelling irradiance as a function of depth.
$F$ Chlorophyll fluorescence.
$H$ Altitude.
$L_u(z,\lambda)$ The spectral upwelling irradiance as a function of depth.
$L_W(\lambda)$ The spectral water-leaving radiance.
$K(\lambda)$ The diffuse attenuation coefficient.
$K_d(\lambda)$ The spectral diffuse attenuation coefficient calculated from $E_d$ data.
$\hat{K}_d$ The modeled diffuse attenuation coefficient.
$\tilde{K}_d$ The measured diffuse attenuation coefficient.
$K_{L_u}(\lambda)$ The spectral diffuse attenuation coefficient calculated from $L_u$ data.
$m$ The relative air mass.
$P$ Atmospheric pressure.
$P_0$ The standard atmospheric pressure at sea level.
$R^2$ The square of the linear correlation coefficient.
$R_{rs}$ Remote sensing reflectance.
$S$ Salinity.
$T$ Temperature.
$T_r$ Transmittance in percent of light transmitted.
$y$ The ordinate, meridional coordinate, or an empirical factor (depending on usage).
$z$ The vertical coordinate (frequently water depth).
$\alpha$ The Ångström exponent.
$\beta$ The Ångström coefficient.
$\theta$ The sun zenith angle.
$\lambda$ Wavelength.
$\lambda_i$ A particular wavelength.
$\tau(\lambda)$ The spectral atmospheric total optical thickness.
$\hat{\tau}_A(783)$ The estimated atmospheric optical thickness at 783 nm using the Ångström law parameters computed for the pair ($\tau_A(671)$,$\tau_A(868)$).
$\tilde{\tau}_A(783)$ The measured atmospheric optical thickness at 783 nm.
$\tau_A$ The aerosols component (molecules of the air) of the atmospheric optical thickness.
$\tau_O$ The ozone component (molecules of the air) of the atmospheric optical thickness.
$\tau_R$ The Rayleigh component (molecules of the air) of the atmospheric optical thickness.

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**13. ABSTRACT** *(Maximum 200 words)*

This report documents the scientific activities on board the Royal Research Ship (RRS) *James Clark Ross* (JCR) during the fifth Atlantic Meridional Transect (AMT-5), 14 September to 17 October 1997. There are three objectives of the AMT Program. The first is to derive an improved understanding of the links between biogeochemical processes, biogenic gas exchange, air–sea interactions, and the effects on, and responses of, oceanic ecosystems to climate change. The second is to investigate the functional roles of biological particles and processes that influence ocean color in ecosystem dynamics. The Program relates directly to algorithm development and the validation of remotely-sensed observations of ocean color. Because the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) instrument achieved operational status during the cruise (on 18 September), AMT-5 was designated the SeaWiFS Atlantic Characterization Experiment (SeaACE) and was the only major research cruise involved in the validation of SeaWiFS data during the first 100 days of operations. This third objective involved the near-real time reporting of *in situ* light and pigment observations to the SeaWiFS Project, so the performance of the satellite sensor could be determined.

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