

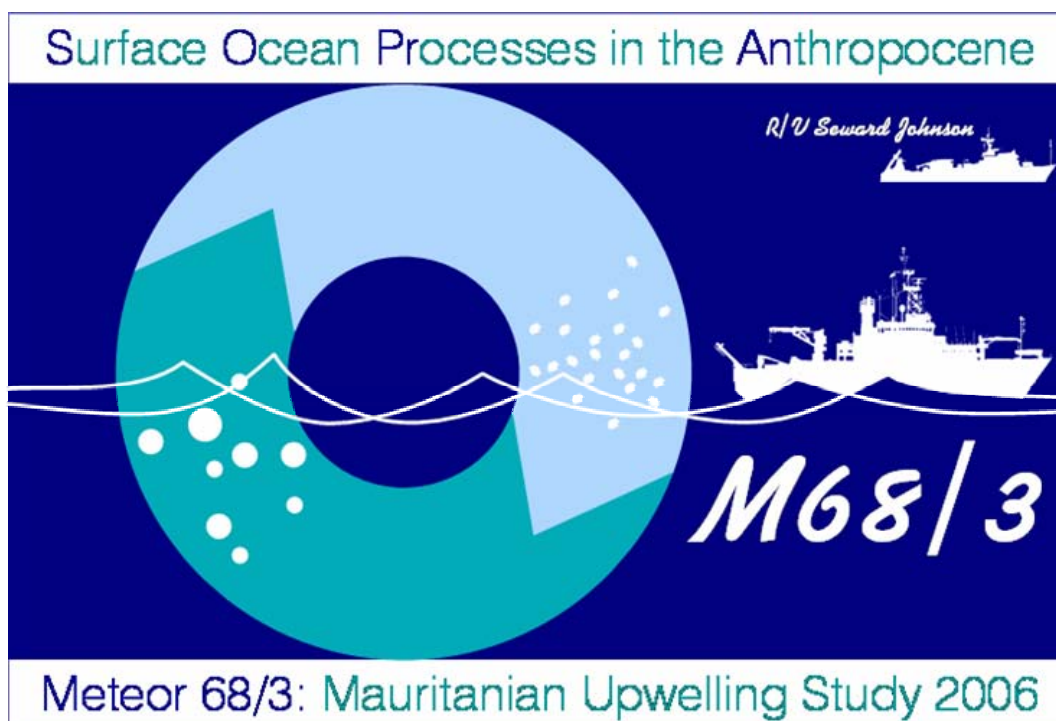
SHORT CRUISE REPORT

RV METEOR Cruise 68/3

from Mindelo, Cape Verde to Las Palmas de Gran Canaria, Spain
July 10 to August 6, 2006

Prof. Dr. Arne Körtzinger, Chief Scientist

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| 14 | Langlois, Rebecca | Bioassay, nitrogen fixation | IFM-GEOMAR |
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| 16 | Levitan, Orly | Bioassay, nitrogen fixation | BIU |
| 17 | Link, Rudolf | CTD, microstructure | IFM-GEOMAR |
| 18 | Malien, Frank | Nutrients, O ₂ | IFM-GEOMAR |
| 19 | Martino, Manuela, Dr. | Iodinated compounds | UEA |
| 20 | Nachtigall, Kerstin | Nutrients, O ₂ | IFM-GEOMAR |
| 21 | Ochsenhirt, Werner | Meteorological technology | DWD |
| 22 | Peeken, Ilka, Dr. | Biogenic trace gas production | IFM-GEOMAR |
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| 29 | Taddei, Stefano, Dr. | Micrometeorology | IBIMET-CNR |
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Research Program

The third leg of Meteor cruise 68 was carried out in the programmatic frame of the international "Surface Ocean Lower Atmosphere Study" (SOLAS) and presents the 2nd major cruise of German SOLAS. It combines a wide spectrum of biological, chemical and physical oceanography as well as atmospheric chemistry under a regional focus on Cape Verdean waters and coastal upwelling off Mauritania. This region is characterized by important SOLAS-relevant phenomena and processes – most importantly atmospheric dust deposition and coastal upwelling – which have major influence on substances (iron, nutrients, CO₂, volatile oxygenated and halogenated organics) and processes (nitrogen fixation, ocean-atmosphere gas exchange). Upwelling regions in major dust deposition areas can be viewed as biogeochemical reactors which are fuelled simultaneously by vertical supply of macro and micro nutrients from the mesopelagial below and the atmosphere above. At the same time, these regions provide means of ventilation of radiatively and chemically active trace gases (e.g., CO₂, nitrous oxide, bromoform) which are produced sub-surface. The resulting flux densities are larger than in the oligotrophic background waters.

Cruise Narrative

The scientific party for cruise 68/3 embarked in the port of Mindelo on São Vicente in the morning of July 10. That day a total of six 20' containers had to be loaded to the ship. These included three containers packed with equipment as well as three laboratory containers (one air chemistry container and two cleanlab containers) which had to be placed at their appropriate positions on the main working deck and the forecastle, respectively. The placement of the heavy (12 t) air chemistry container of the Max-Planck Institute for Chemistry by a floating harbor crane to its desired position turned out unsafe due to adverse wind conditions and had to be cancelled. Therefore a second approach had to be made on the following day by a shore-based mobile crane. For this reason, however, the RV METEOR had to change position and berth with its portside.

RV METEOR left the pier on July 12 at 900L and anchored in the bay of Mindelo to provide the atmospheric working group with some more time for installation of their large amount of equipment in a seaworthy manner. The one-day delay in loading of the group's laboratory container had made this decision necessary. At 1700L RV METEOR finally "set sails" and steamed towards to westernmost station of a hydrographic transect at 18°N which kept us busy until July 21 (see cruise track in Fig. 1).

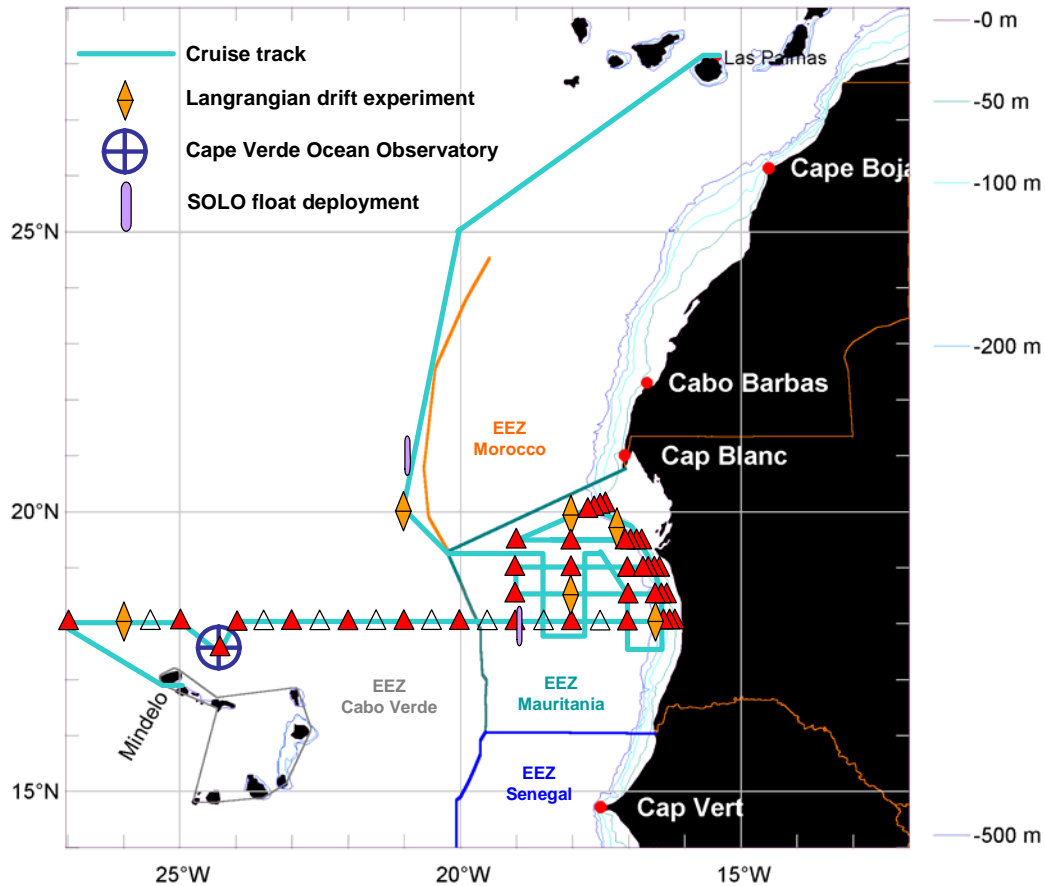


Figure 1: Cruise track of the RV METEOR cruise 68/3 from Mindelo/Cape Verde to Las Palmas de Gran Canaria/Spain (July 12 – August 6, 2006). Shown are locations of hydrographic stations incl. 24h Lagrangian drift stations, the site of the Cape Verde Ocean Observatory, and the deployment sites of two profiling drifters from WHOI.

The 18°N hydrographic section extended from 27°W eastwards and concluded at 16°16.4'W in shallow waters of about 39 m depth. Stations were carried out at 1/2°-spacing with the omission of 26.5°W, a short southward excursion to the newly established Cape Verdean Time Series site at 17°35.4'N/24°15.1'W, and more dense spacing of about 5' above the shelf break. Normal CTD/LADCP profiles extended down to 1000 m depth (or just above seafloor if shallower than 1000 m), with water

sampling performed only in the upper 600 m of the water column. At six stations (stations 257, 261, 264, 268, 272, 276) full water depth hydrocasts were carried out.

Station programs varied slightly during the cruise but typically started with a 1000 m CTD cast with water samples taken in the upper 600 m only. Often a second CTD cast of the upper 200 m was carried out to provide higher vertical resolution as well as larger water volumes required for biological analyses. With a strong focus on the shelf and shelf break region microstructure profiles were made frequently. A typical microstructure station consisted of three profiles taken consecutively at the same station. Roughly every second to third station phytoplankton and/or zooplankton net hauls were done. At nine stations additional GoFlo casts (4 samplers at standard depths of 20, 40, 60, and 80 m) were carried out for trace-metal clean seawater sampling (dissolved and particulate trace metals, iron solubility and dissolution experiments).

After completion of the long 18°N section, four shorter sections (~2° longitude), all roughly orthogonal to the shelf break, were carried out at 18.5°N, 19°N, 19.5°N, and ~20°N. The station program on the section was similar to the one described above.

Measurements performed on water samples drawn from CTD Niskin bottles include the following parameters (list not exhaustive):

- Salinity
- Helium
- SF₆
- Nutrients (Nitrate, nitrite, phosphate, silicate)
- Dissolved oxygen
- Dissolved inorganic carbon (DIC)
- Total alkalinity
- Dissolved organic carbon and nitrogen (DOC/DON)
- Particulate organic carbon and nitrogen (POC/PON)
- $\delta^{13}\text{C}$ -POC, $\delta^{15}\text{N}$ -PON
- Chromophoric dissolved organic matter (CDOM)
- Nitrous oxide (N₂O)
- Hydroxylamine (NH₂OH)
- Dimethylsulphide (DMS), Dimethylsulphoniopropionate (p/d DMSP)
- Hydrogenperoxide (H₂O₂)
- Dissolved Ti, Al
- Iodide, iodate
- Coccolithophorid species abundance
- Diazotroph abundance and activity
- Photosynthetic kinetic parameters (FRRF - Fast repletion rate fluorometry)
- Photosynthetic efficiency (PhytoPAM)
- Phytoplankton pigments
- Flow cytometry (bacteria, pico- and nanoplankton)
- Utermöhl (microphyto- and zooplankton)
- Bacterial community composition (CARD-FISH)
- Bacterial activity (³H-leucine uptake)

- Primary production (^{14}C uptake)

In order to better resolve enhanced turbulence and mixing on the shelf and near the shelf break, two dedicated microstructure transects were carried out (Transect I: 20°15'N/17°44'W – 20°23'N/17°32'W; Transect II: 18°11'N/16°34'W – 18°11'N/16°24'W). Along the two transects microstructure profiles were acquired continuously at low ship speed (approx. 1.5 kn) for about 7 h each.

During the RV METEOR Cruise 68/3 two SOLO profiling floats were deployed on behalf of Robert J. Roddy from NOAA/AOML, Physical Oceanography Department in Miami, FL 33149.

A special focus of this cruise was to study diel cycles of biological, chemical and physical properties in surface waters of various biogeochemical settings. For this purpose six 24h drift stations (258, 277, 286, 299, 304, 311) were performed. At the beginning of each station a patch of surface water was marked by co-located deployment of two Lagrangian drifters: (1) a surface buoy with radar reflector, radio beacon, flash light and flag that carried one or two wheels for *in situ* incubation of quartz bottles at depths of 5 m and/or 20 m, and (2) a surface drifter of the Surface Velocity Program (SVP) with Argos transmitter, thermistor, and holy sock drogue. The RV METEOR followed the surface drifter (1) by optical, radar and radio means for 24 h. Tracking of the SVP drifter by means of a Gonio Argos receiver turned out to be impractical. The estimated directions and intensities of the intercepted Argos messages (90 s interval) were by far not precise enough for tracking purposes. A post-experiment comparison of the drifter trajectories revealed that the two drifters showed very similar drift behavior. It can therefore be assumed that drifter (1) at which all station work was carried showed Lagrangian drift characteristics. The distance covered during the 24h drift experiment varied from 7 to 27 nm (i.e. 0.27 to 1.09 kts). The two drifters stayed within a distance of 1 to 8 nm whereby the Argos positions of SVP drifter are associated with significantly larger error of sometimes up to 1 nm or more.

A sampling schedule of CTD casts (e.g. at 0:00, 6:00, 12:00, 18:00, 24:00 h), underway sampling and microstructure profiles (e.g. every 3 h) was carried out as close as possible to the drifter (typically 2-4 cables). At the end of each 24h drift station the surface-tethered incubation drifter was recovered. The SVP drifters were not recovered since they are an official component of the Surface Velocity Program provided at no charge by the Physical Oceanography Division of the NOAA/AOML in Miami/FL, USA. These drifters have a typical half life of approx. 1.5 years. Drift trajectories accumulated during the course of the METEOR 68/3 cruise are shown in Fig. 2

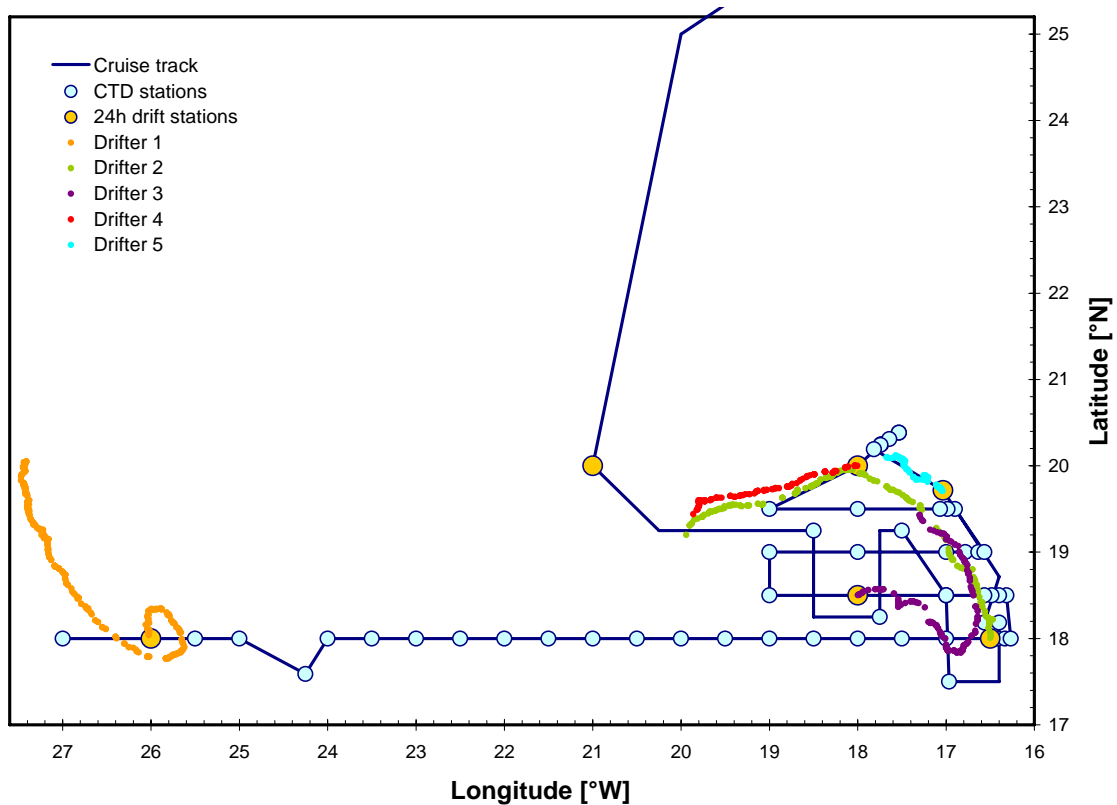


Figure 2: Cruise track of the RV METEOR cruise 68/3 from Mindelo/Cape Verde to Las Palmas de Gran Canaria/Spain (July 12 – August 6, 2006). In addition to the locations of hydrographic stations the trajectories of the SVP surface drifters until early August are shown.

During the entire cruise surface seawater was sampled by means of a submersible pump installed in the ship's moon pool. A small CTD probe was installed next to the intake to provide measurements of surface seawater salinity and temperature. The pumped seawater was used for:

- Continuous $p\text{CO}_2$ measurements using a classical flow-through headspace equilibrator system with NDIR CO_2 detection,
- Continuous $p\text{CO}_2$ measurements using a novel submersible sensor with membrane equilibrator and NDIR CO_2 detection (by Pro-Oceanus Inc., Halifax/Canada),
- Continuous O_2 measurements using a novel oxygen optode (by Aanderaa Instruments, Bergen/Norway),
- Continuous gas tension measurements using a GTD pro gas tension sensor (by Pro-Oceanus Inc., Halifax/Canada),
- Continuous chlorophyll measurements using a submersible MiniTracka fluorescence sensor (Chelsea Instruments, UK),
- Continuous N_2O measurements using a headspace equilibrator with subsequent GC-ECD detection,

- Discrete sampling for other parameters (e.g. nutrients, DIC, total alkalinity, CDOM, chlorophyll, various biological parameters etc.),

Trace-metal clean surface water sampling was accomplished with a tow fish that was lowered into the water by the auxiliary crane on starboard side. Seawater was sampled with an all-teflon membrane pump while the ship was steaming. The pumped seawater was used for trace metal analysis (particularly iron) and for the bioassay work.

A major work component of the biological working groups were a number of dedicated incubation experiments. For this purpose several types of incubators were installed on the working deck and on the forecastle. All incubation devices were fed with large flow rates of surface seawater (through fire extinguishing pumps) to ensure thermostating to near SST and provided with shades for simulation of different light levels. Incubation experiments were performed on the following aspects:

- Long-term (10-day) dark experiments to investigate impact of heterotrophic communities on biogenic trace gas production (jointly with atmospheric working group);
- Possible pathways of biogenic production of iodine and iodinated compounds;
- Impact of variable plankton communities and light intensities on production of inorganic and organic trace gases (jointly with atmospheric working group);
- Bioassays to assess the limitation of nutrients (ammonia, nitrate, phosphate, iron, dust, DOC) under ambient and elevated $p\text{CO}_2$ levels;

In situ light incubations for production of halogenated organic compounds were executed with free-drifting, surface-tethered incubation wheels deployed at 24h drift stations (see description of 24h drift stations above).

The RV METEOR Cruise 68/3 also carried a significant atmospheric program which included the following major components:

- Daily size-segregated aerosol sampling for analysis of major ions, soluble nutrient species (Fe, N, P, Si), and iodine species;
- Analysis of headspace samples from various incubation experiments for CO, non-methane hydrocarbons, volatile oxygenated organics, and volatile halocarbons (together with biological group);
- Micrometeorological measurements of air-sea fluxes (DEC – Disjunct Eddy Covariance, VDEC – Virtual Disjunct Eddy Covariance, REA – Relaxed Eddy Accumulation) with online PTR-MS detection (Proton Transfer Reaction Mass Spectrometry) or cartridge sampling;
- GC-MS measurements of mixing ratios of halogenated compounds in air (CH_3Cl , CH_3Br , CH_3I);
- Aethelometer measurements of black carbon;
- Radon measurements with thorium-daughter detection system;
- GC-FIC measurements of methane.

Due to perfect performance of the CTD-rosette system and the winches the intended station program of RV METEOR Cruise 68/3 was overachieved. No down-time due to technical problems or bad weather had to be accommodated in the work program. All groups bring home a rich data harvest and mostly achieved their work plans. Only a few technical problems with instrumentation caused significant and in one case fatal damage to scientific components of the M68/3 undertaking. Overall the mission has been very successful and extremely pleasant.

RV METEOR reached Las Palmas de Gran Canaria in the early morning of August 6 (0800L) and the usual container packing chaos quickly unfolded. The scientific party disembarked in the afternoon.

I would like to conclude this short cruise report with my very best thanks to

- Mr. Jemal Ould Abed, our Mauritanian observer, for good cooperation and spirit;
- the scientific party for high motivation, endurance and team spirit; and
- the RV METEOR cruise for outstanding performance and cooperativeness well beyond the call of duty;

On the occasion of the very last cruise of Captain Martin Kull I also address to him my sincere thanks for a great service to the German oceanographic community and my very best wishes for the upcoming years – less stressfull, more easygoing but still with the same unfailing energy and motivation.

Table 1: CTD/LADCP stations

| Ship exocode | Station No. | CTD Profile No. | Date Start UTC | Time Start UTC | Lat. Degrees Start | Lat. Minutes Start | Lon. Degrees Start | Lon Minutes Start | Water depth | Max pressure | No. Of Bottles |
|-----------------|-------------|--------------------|-------------------|-------------------|--------------------------|--------------------------|--------------------------|-------------------------|----------------|-----------------|-------------------|
| 06ME68/3 | 256 | 1 | 12.07.2006 | 20:29 | 16° N | 58.2' | 25° W | 29.6' | 1977.0 | 301.0 | 21 |
| 06ME68/3 | 257 | 2 | 13.07.2006 | 06:50 | 17° N | 59.9' | 27° W | 0.1' | 4326.0 | 401.0 | 21 |
| 06ME68/3 | 257 | 3 | 13.07.2006 | 08:27 | 17° N | 59.9' | 27° W | 0.1' | 4325.0 | 4256.0 | 21 |
| 06ME68/3 | 258 | 4 | 13.07.2006 | 21:20 | 18° N | 0.1' | 26° W | 0.1' | 3892.0 | 1006.0 | 21 |
| 06ME68/3 | 258 | 5 | 14.07.2006 | 00:34 | 18° N | 2.6' | 26° W | 1.8' | 3891.0 | 202.0 | 21 |
| 06ME68/3 | 258 | 6 | 14.07.2006 | 06:35 | 18° N | 4.8' | 26° W | 2.1' | 3911.0 | 198.0 | 21 |
| 06ME68/3 | 258 | 7 | 14.07.2006 | 09:32 | 18° N | 5.6' | 26° W | 3.1' | 3920.0 | 200.0 | 21 |
| 06ME68/3 | 258 | 8 | 14.07.2006 | 12:34 | 18° N | 7.6' | 26° W | 3.3' | 3924.0 | 201.0 | 21 |
| 06ME68/3 | 258 | 9 | 14.07.2006 | 15:31 | 18° N | 9.7' | 26° W | 2.7' | 3927.0 | 201.0 | 21 |
| 06ME68/3 | 258 | 10 | 14.07.2006 | 18:29 | 18° N | 10.1' | 26° W | 2.3' | 3925.0 | 200.0 | 21 |
| 06ME68/3 | 258 | 11 | 14.07.2006 | 21:31 | 18° N | 10.8' | 26° W | 2.0' | 3932.0 | 200.0 | 21 |
| 06ME68/3 | 259 | 12 | 15.07.2006 | 02:12 | 18° N | 0.1' | 25° W | 30.0' | 3464.0 | 1003.0 | 21 |
| 06ME68/3 | 260 | 13 | 15.07.2006 | 06:37 | 18° N | 0.0' | 25° W | 0.1' | 3649.0 | 997.0 | 21 |
| 06ME68/3 | 261 | 14 | 15.07.2006 | 20:01 | 17° N | 36.5' | 24° W | 16.2' | 3604.0 | 11.0 | 21 |
| 06ME68/3 | 261 | 15 | 15.07.2006 | 20:17 | 17° N | 36.8' | 24° W | 16.0' | 3606.0 | 401.0 | 21 |
| 06ME68/3 | 261 | 16 | 15.07.2006 | 21:52 | 17° N | 37.4' | 24° W | 15.7' | 3606.0 | 3584.0 | 21 |
| 06ME68/3 | 262 | 17 | 16.07.2006 | 06:55 | 18° N | 60.0' | 24° W | 0.0' | 3651.0 | 1006.0 | 21 |
| 06ME68/3 | 263 | 18 | 16.07.2006 | 13:00 | 17° N | 59.5' | 23° W | 30.2' | 3797.0 | 1001.0 | 21 |
| 06ME68/3 | 264 | 19 | 16.07.2006 | 17:05 | 18° N | 0.1' | 23° W | 0.2' | 3501.0 | 400.0 | 21 |
| 06ME68/3 | 264 | 20 | 16.07.2006 | 18:25 | 18° N | 0.1' | 23° W | 0.6' | 3505.0 | 3501.0 | 21 |
| 06ME68/3 | 265 | 21 | 17.07.2006 | 01:00 | 17° N | 59.8' | 23° W | 30.3' | 3333.0 | 1001.0 | 21 |
| 06ME68/3 | 266 | 22 | 17.07.2006 | 06:30 | 18° N | 0.1' | 22° W | 0.1' | 3296.0 | 1002.0 | 21 |
| 06ME68/3 | 267 | 23 | 17.07.2006 | 13:00 | 17° N | 59.7' | 21° W | 30.2' | 3185.0 | 991.0 | 21 |
| 06ME68/3 | 268 | 24 | 17.07.2006 | 17:00 | 17° N | 60.0' | 21° W | 0.1' | 3075.0 | 399.0 | 21 |
| 06ME68/3 | 268 | 25 | 17.07.2006 | 18:23 | 18° N | 0.3' | 21° W | 0.7' | 3071.0 | 3040.0 | 21 |
| 06ME68/3 | 269 | 26 | 18.07.2006 | 00:39 | 18° N | 0.0' | 20° W | 30.0' | 3120.0 | 998.0 | 21 |
| 06ME68/3 | 270 | 27 | 18.07.2006 | 06:03 | 18° N | 0.2' | 20° W | 1.1' | 3200.0 | 994.0 | 21 |
| 06ME68/3 | 271 | 28 | 18.07.2006 | 12:00 | 17° N | 59.4' | 19° W | 30.3' | 3227.0 | 989.0 | 21 |
| 06ME68/3 | 272 | 29 | 18.07.2006 | 17:00 | 18° N | 0.0' | 19° W | 0.0' | 3139.0 | 387.0 | 21 |
| 06ME68/3 | 272 | 30 | 18.07.2006 | 18:20 | 18° N | 0.5' | 19° W | 1.0' | 3151.0 | 3156.0 | 21 |
| 06ME68/3 | 273 | 31 | 19.07.2006 | 00:42 | 17° N | 60.0' | 18° W | 30.0' | 3028.0 | 1001.0 | 21 |
| 06ME68/3 | 274 | 32 | 19.07.2006 | 06:18 | 17° N | 59.9' | 18° W | 0.0' | 2804.0 | 1005.0 | 21 |
| 06ME68/3 | 275 | 33 | 19.07.2006 | 11:50 | 17° N | 60.0' | 17° W | 30.2' | 2517.0 | 1003.0 | 21 |
| 06ME68/3 | 276 | 34 | 19.07.2006 | 16:00 | 18° N | 0.0' | 17° W | 0.0' | 1712.0 | 401.0 | 21 |
| 06ME68/3 | 276 | 35 | 19.07.2006 | 17:16 | 17° N | 59.9' | 17° W | 0.4' | 1730.0 | 1700.0 | 21 |
| 06ME68/3 | 277 | 36 | 19.07.2006 | 22:35 | 18° N | 0.5' | 16° W | 29.9' | 193.0 | 182.0 | 21 |
| 06ME68/3 | 277 | 37 | 20.07.2006 | 04:00 | 18° N | 3.7' | 16° W | 29.9' | 190.0 | 178.0 | 21 |
| 06ME68/3 | 277 | 38 | 20.07.2006 | 10:45 | 18° N | 9.1' | 16° W | 30.8' | 185.0 | 161.0 | 21 |
| 06ME68/3 | 277 | 39 | 20.07.2006 | 15:52 | 18° N | 13.8' | 16° W | 32.1' | 199.0 | 192.0 | 21 |
| 06ME68/3 | 277 | 40 | 20.07.2006 | 22:07 | 18° N | 18.0' | 16° W | 33.1' | 202.0 | 181.0 | 21 |
| 06ME68/3 | 278 | 41 | 21.07.2006 | 01:15 | 18° N | 0.3' | 16° W | 25.1' | 107.0 | 101.0 | 21 |
| 06ME68/3 | 279 | 42 | 21.07.2006 | 02:47 | 18° N | 0.2' | 16° W | 20.0' | 72.0 | 75.0 | 21 |
| 06ME68/3 | 280 | 43 | 21.07.2006 | 04:20 | 18° N | 3.1' | 16° W | 16.4' | 39.0 | 37.0 | 21 |
| 06ME68/3 | 281 | 44 | 21.07.2006 | 07:09 | 18° N | 30.0' | 16° W | 19.0' | 39.0 | 26.0 | 21 |
| 06ME68/3 | 282 | 45 | 21.07.2006 | 08:14 | 18° N | 30.1' | 16° W | 24.1' | 56.0 | 50.0 | 21 |
| 06ME68/3 | 283 | 46 | 21.07.2006 | 09:25 | 18° N | 30.1' | 16° W | 29.1' | 85.0 | 80.0 | 21 |
| 06ME68/3 | 284 | 47 | 21.07.2006 | 11:18 | 18° N | 29.6' | 16° W | 34.6' | 182.0 | 160.0 | 21 |
| 06ME68/3 | 285 | 48 | 21.07.2006 | 15:29 | 18° N | 30.0' | 17° W | 0.0' | 1611.0 | 47.0 | 21 |
| 06ME68/3 | 285 | 49 | 21.07.2006 | 16:01 | 18° N | 30.4' | 17° W | 0.0' | 2686.0 | 992.0 | 21 |
| 06ME68/3 | 286 | 50 | 22.07.2006 | 00:34 | 18° N | 30.7' | 17° W | 58.6' | 2624.0 | 1001.0 | 21 |
| 06ME68/3 | 286 | 51 | 22.07.2006 | 06:30 | 18° N | 31.5' | 17° W | 53.0' | 2484.0 | 206.0 | 21 |
| 06ME68/3 | 286 | 52 | 22.07.2006 | 13:59 | 18° N | 30.7' | 17° W | 44.6' | 2517.0 | 199.0 | 21 |
| 06ME68/3 | 286 | 53 | 22.07.2006 | 18:58 | 18° N | 29.4' | 17° W | 39.8' | 2433.0 | 245.0 | 21 |
| 06ME68/3 | 286 | 54 | 22.07.2006 | 23:41 | 18° N | 25.4' | 17° W | 33.1' | 2433.0 | 199.0 | 21 |
| 06ME68/3 | 287 | 55 | 23.07.2006 | 09:06 | 18° N | 29.9' | 19° W | 0.0' | 3046.0 | 996.0 | 21 |
| 06ME68/3 | 288 | 56 | 23.07.2006 | 14:21 | 18° N | 59.8' | 19° W | 0.4' | 3005.0 | 1001.0 | 21 |
| 06ME68/3 | 289 | 57 | 23.07.2006 | 20:37 | 19° N | 0.1' | 17° W | 60.0' | 2551.0 | 1003.0 | 21 |
| 06ME68/3 | 290 | 58 | 24.07.2006 | 04:05 | 19° N | 0.2' | 17° W | 0.1' | 1172.0 | 801.0 | 21 |
| 06ME68/3 | 291 | 59 | 24.07.2006 | 06:39 | 19° N | 0.1' | 16° W | 47.1' | 194.0 | 180.0 | 21 |
| 06ME68/3 | 292 | 60 | 24.07.2006 | 09:36 | 19° N | 0.1' | 16° W | 38.0' | 85.0 | 80.0 | 21 |
| 06ME68/3 | 293 | 61 | 24.07.2006 | 12:39 | 19° N | 0.4' | 16° W | 33.8' | 67.0 | 61.0 | 21 |
| 06ME68/3 | 294 | 62 | 24.07.2006 | 20:22 | 19° N | 30.0' | 16° W | 54.1' | 72.0 | 71.0 | 21 |
| 06ME68/3 | 295 | 63 | 24.07.2006 | 21:49 | 19° N | 30.0' | 16° W | 59.1' | 103.0 | 98.0 | 21 |
| 06ME68/3 | 296 | 64 | 24.07.2006 | 23:25 | 19° N | 30.1' | 17° W | 4.0' | 552.0 | 449.0 | 21 |
| 06ME68/3 | 297 | 65 | 25.07.2006 | 06:29 | 19° N | 30.0' | 18° W | 0.3' | 2322.0 | 1001.0 | 21 |
| 06ME68/3 | 298 | 66 | 25.07.2006 | 12:56 | 19° N | 30.1' | 19° W | 0.1' | 2975.0 | 1003.0 | 21 |
| 06ME68/3 | 299 | 67 | 26.07.2006 | 00:32 | 19° N | 59.7' | 18° W | 2.6' | 1943.0 | 1020.0 | 21 |
| 06ME68/3 | 299 | 68 | 26.07.2006 | 06:31 | 19° N | 57.8' | 18° W | 6.0' | 2002.0 | 200.0 | 21 |
| 06ME68/3 | 299 | 69 | 26.07.2006 | 13:01 | 19° N | 56.1' | 18° W | 11.2' | 2164.0 | 200.0 | 21 |
| 06ME68/3 | 299 | 70 | 26.07.2006 | 19:06 | 19° N | 53.0' | 18° W | 16.0' | 2289.0 | 201.0 | 21 |
| 06ME68/3 | 299 | 71 | 26.07.2006 | 23:29 | 19° N | 51.7' | 18° W | 20.7' | 2401.0 | 201.0 | 21 |
| 06ME68/3 | 300 | 72 | 27.07.2006 | 12:35 | 20° N | 23.1' | 17° W | 32.0' | 64.0 | 50.0 | 21 |

Table 2: Microstructure stations

| Date | Station | CTD cast | Water depth | Time | Start latitude | | Start longitude | | MSS profiles | max pressure |
|------------|-----------|------------|-------------|-------|----------------|-----------|-----------------|-----------|--------------|--------------|
| [UTC] | No. | No. | [m] | [UTC] | degrees N | minutes N | degrees W | minutes W | No. | [dbar] |
| 13.07.2006 | 257 | 3 | 4317 | 11:49 | 18 | 1.24 | 26 | 59.27 | 1_3 | 249 |
| 13.07.2006 | 258 | 4 | 3891 | 22:40 | 18 | 1.17 | 25 | 59.83 | 4-6 | 234 |
| 14.07.2006 | 258 | 5 | 3903 | 01:15 | 18 | 2.90 | 26 | 1.90 | 7-9 | 245 |
| 14.07.2006 | 258 | 6 | 3915 | 07:20 | 18 | 5.27 | 26 | 2.27 | 10-12 | 261 |
| 14.07.2006 | 258 | 7 | 3924 | 10:18 | 18 | 6.05 | 26 | 3.47 | 13-15 | 276 |
| 14.07.2006 | 258 | 8 | 3921 | 13:15 | 18 | 8.01 | 26 | 2.90 | 16-18 | 251 |
| 14.07.2006 | 258 | 9 | 3923 | 16:11 | 18 | 9.70 | 26 | 2.00 | 19-21 | 253 |
| 14.07.2006 | 258 | 10 | 3928 | 19:15 | 18 | 10.36 | 26 | 1.94 | 22-24 | 308 |
| 19.07.2006 | 277 | 36 | 195 | 23:14 | 18 | 0.64 | 16 | 29.86 | 25-27 | 185 |
| 20.07.2006 | 277 | 36 | 124 | 02:39 | 18 | 2.97 | 16 | 29.19 | 28-30 | 124 |
| 20.07.2006 | 277 | 37 | 189 | 04:35 | 18 | 4.30 | 16 | 30.00 | 31-33 | 168 |
| 20.07.2006 | 277 | 38 | 179 | 10:05 | 18 | 8.90 | 16 | 30.68 | 34-36 | 167 |
| 20.07.2006 | 277 | 38 | 206 | 14:30 | 18 | 12.60 | 16 | 32.10 | 37-39 | 212 |
| 20.07.2006 | 277 | 39 | 212 | 18:00 | 18 | 15.70 | 16 | 32.81 | 40-42 | 213 |
| 21.07.2006 | 278 | 41 | 106 | 01:35 | 18 | 0.80 | 16 | 24.90 | 43-46 | 98 |
| 21.07.2006 | 279 | 42 | 78 | 03:07 | 18 | 0.80 | 16 | 20.10 | 47-49 | 72.9 |
| 21.07.2006 | 282 | 45 | 55 | 08:32 | 18 | 30.49 | 16 | 24.15 | 50-52 | 53 |
| 21.07.2006 | 283 | 46 | 88 | 09:46 | 18 | 30.46 | 16 | 29.33 | 53-55 | 85 |
| 21.07.2006 | 284 | 47 | 172 | 10:45 | 18 | 29.55 | 16 | 33.98 | 56-58 | 170 |
| 24.07.2006 | 291 | 59 | 219 | 07:35 | 19 | 0.11 | 16 | 47.79 | 59-62 | 170 |
| 24.07.2006 | 292 | 60 | 84 | 09:59 | 19 | 0.16 | 16 | 38.02 | 63-66 | 78.8 |
| 24.07.2006 | 293 | 61 | 66 | 13:02 | 19 | 0.39 | 16 | 33.91 | 67-71 | 63 |
| 24.07.2006 | 294 | 62 | 73 | 20:44 | 19 | 30.03 | 16 | 54.16 | 72-76 | 68 |
| 24.07.2006 | 295 | 63 | 102 | 22:14 | 19 | 30.21 | 16 | 59.44 | 77-80 | 99 |
| 25.07.2006 | 296 | 64 | 550 | 00:17 | 19 | 30.85 | 17 | 4.29 | 81-83 | 258 |
| 27.07.2006 | after 299 | Transect 1 | 522 | 05:44 | 20 | 15.18 | 17 | 44.06 | 84-89 | 278 |
| 27.07.2006 | after 299 | Transect 1 | 396 | 07:38 | 20 | 16.68 | 17 | 41.48 | 90-103 | 231 |
| 27.07.2006 | after 299 | Transect 1 | 89 | 09:52 | 20 | 19.50 | 17 | 37.28 | 104-117 | 84.1 |
| 27.07.2006 | after 299 | Transect 1 | 72 | 11:26 | 20 | 21.76 | 17 | 33.88 | 118_131 | 66.8 |
| 28.07.2006 | 304 | 80 | 81 | 19:17 | 19 | 44.67 | 17 | 3.67 | 132-145 | 80.2 |
| 29.07.2006 | after 305 | Transect 2 | 416 | 12:40 | 18 | 11.01 | 16 | 33.39 | 146-150 | 229 |
| 29.07.2006 | after 305 | Transect 2 | 83 | 16:38 | 18 | 11.00 | 16 | 25.20 | 151-175 | 93 |
| 29.07.2006 | after 305 | Transect 2 | 122 | 19:10 | 18 | 10.78 | 16 | 29.07 | 176-178 | 124 |
| 29.07.2006 | after 305 | Transect 2 | 152 | 19:46 | 18 | 10.88 | 16 | 30.16 | 179-181 | 153.4 |
| 29.07.2006 | after 305 | Transect 2 | 176 | 20:28 | 18 | 11.39 | 16 | 30.99 | 182-184 | 201.9 |
| 01.08.2006 | 311 | 90 | 3735 | 21:06 | 20 | 0.38 | 20 | 59.87 | 185-187 | 341 |
| 02.08.2006 | 311 | 91 | 2729 | 01:28 | 19 | 59.80 | 20 | 59.60 | 188-19 | 309 |
| 02.08.2006 | 311 | 92 | 3727 | 03:08 | 19 | 59.20 | 21 | 0.20 | 191-193 | 311 |
| 02.08.2006 | 311 | 93 | 3733 | 06:21 | 19 | 59.66 | 21 | 1.31 | 194-196 | 311.5 |
| 02.08.2006 | 311 | 93 | 3737 | 09:19 | 19 | 59.94 | 21 | 1.16 | 197-199 | 274.1 |
| 02.08.2006 | 311 | 94 | 3736 | 12:17 | 20 | 0.11 | 21 | 0.27 | 200-202 | 190 |
| 02.08.2006 | 311 | 94 | 3736 | 14:14 | 20 | 0.10 | 20 | 59.50 | 203-205 | 299 |
| 02.08.2006 | 311 | 95 | 3727 | 18:30 | 19 | 59.39 | 20 | 59.78 | 206-208 | 294 |
| 02.08.2006 | 311 | 96 | 3724 | 21:20 | 19 | 58.35 | 20 | 54.46 | 209-211 | 250 |

Table 3: Vertical phytoplankton and zooplankton net hauls

| Station no. | PN | ZPN | Latitude | | | Longitude | | |
|-------------|----|-----|----------|-------|-----|-----------|-------|-----|
| | | | ° | ' | N/S | ° | ' | W/E |
| 256 | X | | 18 | 0.02 | N | 26 | 59.96 | W |
| | X | | 18 | 0.08 | N | 26 | 59.89 | W |
| 260 | X | | 18 | 0.59 | N | 25 | 0.08 | W |
| | | X | 18 | 0.78 | N | 25 | 0.32 | W |
| | | X | 18 | 0.82 | N | 25 | 0.45 | W |
| 266 | X | | 18 | 0.20 | N | 21 | 59.96 | W |
| | | X | 18 | 0.20 | N | 21 | 59.91 | W |
| | | X | 18 | 0.25 | N | 21 | 59.94 | W |
| 270 | X | | 17 | 59.97 | N | 20 | 0.42 | W |
| | | X | 18 | 0.13 | N | 20 | 0.66 | W |
| | | X | 18 | 0.22 | N | 20 | 0.81 | W |
| 274 | | X | 17 | 59.95 | N | 18 | 0.06 | W |
| | | X | 18 | 59.98 | N | 18 | 0.01 | W |
| | X | | 17 | 59.95 | N | 17 | 59.99 | W |
| 277 | X | | 18 | 13.60 | N | 16 | 32.20 | W |
| 284 | X | | 18 | 29.92 | N | 16 | 35.37 | W |
| | | X | 18 | 30.00 | N | 16 | 35.44 | W |
| | | X | 18 | 30.10 | N | 16 | 35.50 | W |
| 286 | X | | 18 | 32.20 | N | 17 | 46.31 | W |
| 287 | | X | 18 | 30.15 | N | 19 | 2.11 | W |
| | | X | 18 | 30.13 | N | 19 | 2.52 | W |
| 288 | X | | 18 | 59.90 | N | 19 | 0.20 | W |
| | X | | 18 | 59.90 | N | 19 | 0.30 | W |
| 293 | X | | 19 | 0.21 | N | 16 | 33.80 | W |
| | | X | 19 | 0.22 | N | 16 | 33.82 | W |
| | | X | 19 | 0.29 | N | 16 | 33.81 | W |
| 297 | X | | 19 | 30.10 | N | 18 | 0.07 | W |
| | | X | 19 | 30.02 | N | 18 | 0.17 | W |
| | | X | 19 | 29.99 | N | 18 | 0.21 | W |
| 299 | X | | 19 | 54.05 | N | 18 | 14.53 | W |
| | | X | 19 | 52.63 | N | 18 | 17.60 | W |
| | | X | 19 | 52.60 | N | 18 | 17.82 | W |
| 303 | X | | 20 | 12.47 | N | 17 | 43.67 | W |
| 305 | X | | 18 | 11.41 | N | 16 | 34.23 | W |
| | X | | 18 | 11.10 | N | 16 | 33.60 | W |
| 306 | | X | 17 | 29.86 | N | 16 | 58.80 | W |
| | | X | 17 | 29.77 | N | 16 | 58.88 | W |
| 307 | X | | 18 | 29.90 | N | 17 | 0.30 | W |
| 308 | | X | 19 | 15.05 | N | 17 | 30.24 | W |
| | | X | 19 | 15.10 | N | 17 | 30.25 | W |
| 309 | X | | 18 | 15.18 | N | 17 | 45.14 | W |
| | | X | 18 | 15.07 | N | 17 | 45.10 | W |
| | | X | 18 | 15.02 | N | 17 | 45.09 | W |
| 311 | | X | 20 | 0.10 | N | 21 | 0.10 | W |
| | | X | 20 | 0.10 | N | 21 | 0.30 | W |
| | | X | 19 | 58.10 | N | 20 | 58.02 | W |

Table 4: GoFlo casts (trace metal clean water sampling)

| Station no. | Bottle depths | | | | Latitude | | | Longitude | | |
|-------------|---------------|----|----|----|----------|-------|-----|-----------|-------|-----|
| | 20 | 40 | 60 | 80 | ° | ' | N/S | ° | ' | W/E |
| 261 | 20 | 40 | 60 | 80 | 17 | 37.36 | N | 24 | 15.68 | W |
| 264 | 20 | 40 | 60 | 80 | 18 | 0.12 | N | 23 | 0.59 | W |
| 268 | 20 | 40 | 60 | 80 | 18 | 0.19 | N | 21 | 0.68 | W |
| 272 | 20 | 40 | 60 | 80 | 18 | 0.48 | N | 19 | 0.90 | W |
| 277 | 20 | 40 | 60 | 80 | 18 | 16.71 | N | 16 | 32.68 | W |
| 284 | 20 | 40 | 60 | 80 | 18 | 29.81 | N | 16 | 35.25 | W |
| 289 | 20 | 40 | 60 | 80 | 19 | 0.13 | N | 18 | 0.02 | W |
| 307 | 20 | 40 | 60 | 80 | 18 | 29.30 | N | 17 | 1.70 | W |
| 311 | 20 | 40 | 60 | 80 | 19 | 59.20 | N | 20 | 59.96 | W |

Table 5: Surface drifter deployments (SVP – Surface Velocity Program)

| Argos ID | WMO # | Date dd.mm.yy | Time UTC | Longitude | Latitude | Sensors |
|----------|-------|------------------|-------------|----------------|----------------|---------|
| 62279 | 13640 | 14.07.06 | 00:12 | 26 ° 01,50 ' W | 18 ° 02,28 ' N | T |
| 62278 | 13639 | 19.07.06 | 22:15 | 18 ° 29,92 ' W | 18 ° 00,30 ' N | T |
| 62277 | 13638 | 21.07.06 | 22:10 | 17 ° 59,82 ' W | 18 ° 30.20 ' N | T |
| 62276 | 13637 | 25.07.06 | 21:16 | 18 ° 00,33 ' W | 19 ° 59.96 ' N | T |
| 62275 | 13636 | 27.07.06 | 23:21 | 17 ° 03,27 ' W | 19 ° 4,15 ' N | T |

Table 6: Profiling float deployments (ARGO)

| Float S/N | WMO | ID (DEC) | Date dd.mm.yy | Time UTC | Longitude | Latitude | Sensors | Depth | |
|--------------|-----------|----------|------------------|-------------|----------------|----------------|---------|-------|---------|
| | | | | | | | | Park | Profile |
| 604 | WHOI SOLO | | 18.07.06 | 16:30 | 19 ° 01,00 ' W | 18 ° 00,00 ' N | T/S/P | 1000 | 1100 |
| 551 | WHOI SOLO | | 02.08.06 | 23:52 | 20 ° 59.43 ' W | 19 ° 58,03 ' N | T/S/P | 1000 | 1100 |