

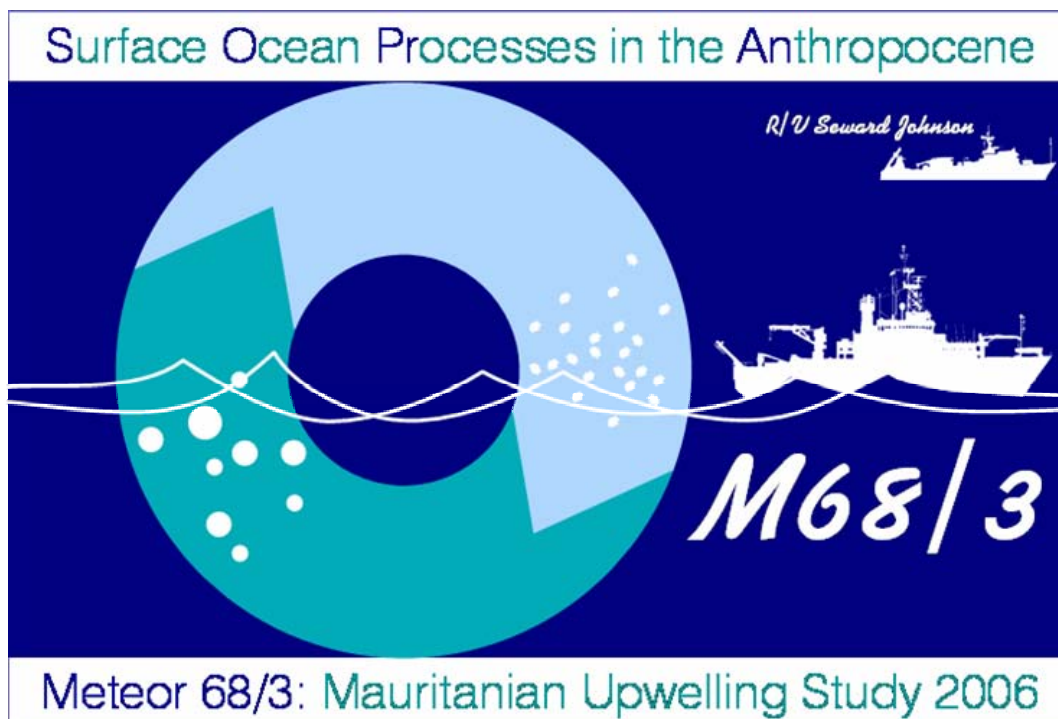
# SHORT CRUISE REPORT

## 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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6	Bluhm, Katrin	Biogenic trace gas production	IFM-GEOMAR
7	Croot, Peter, Dr.	Trace metals	IFM-GEOMAR
8	Custer, Thomas, Dr.	Atmospheric chemistry	MPI-CH
9	Franklin, Dan, Dr.	DMS	UEA
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12	Grobe, Susann	Carbon cycle	IFM-GEOMAR
13	Gros, Valérie, Dr.	Atmospheric chemistry	LSCE
14	Langlois, Rebecca	Bioassay, nitrogen fixation	IFM-GEOMAR
15	Lee, Gareth	DMS	UEA
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17	Link, Rudolf	CTD, microstructure	IFM-GEOMAR
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21	Ochsenhirt, Werner	Meteorological technology	DWD
22	Peeken, Ilka, Dr.	Biogenic trace gas production	IFM-GEOMAR
23	Petrick, Gert	Halocarbons	IFM-GEOMAR
24	Pröbst, Stefanie	Bioassay, nitrogen fixation	IFM-GEOMAR
25	Schafstall, Jens	CTD, microstructure	IFM-GEOMAR
26	Schlosser, Christian	Trace metals	IFM-GEOMAR
27	Steinhoff, Tobias	Carbon cycle	IFM-GEOMAR
28	Streu, Peter	Trace metals	IFM-GEOMAR
29	Taddei, Stefano, Dr.	Micrometeorology	IBIMET-CNR
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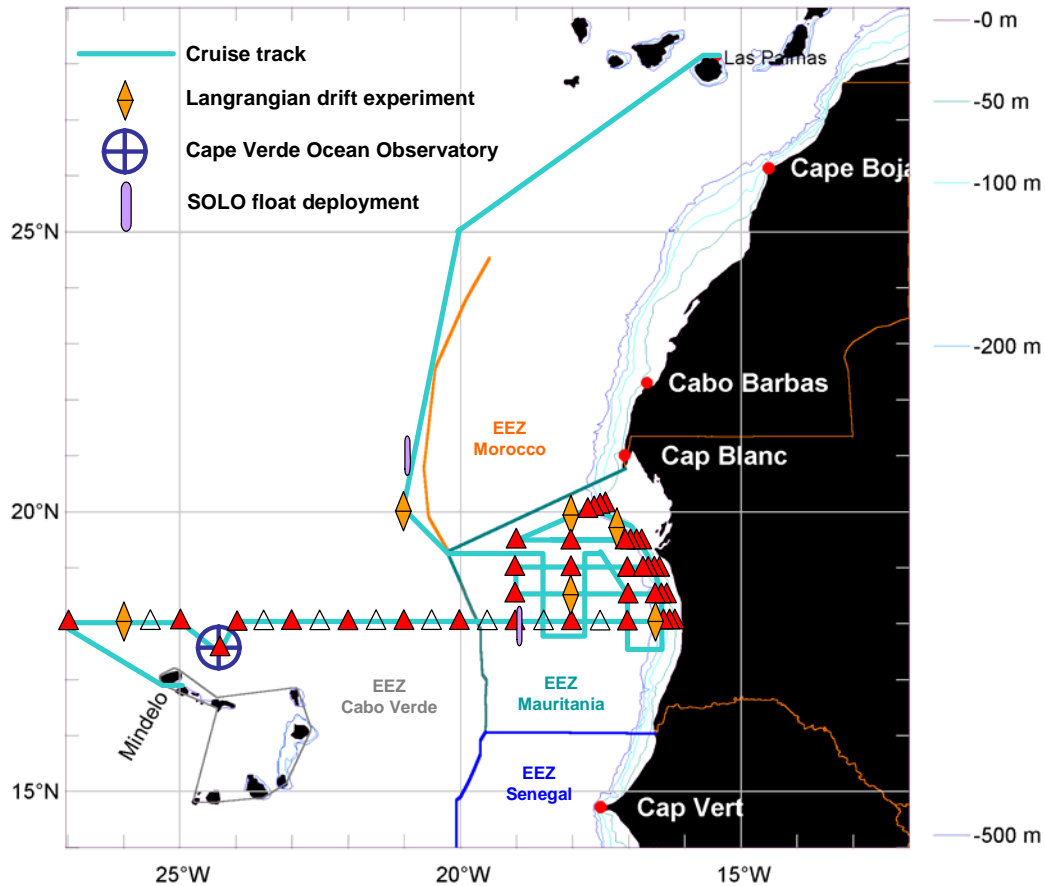
## Research Program

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 2<sup>nd</sup> 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, CO<sub>2</sub>, 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., CO<sub>2</sub>, 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
- SF<sub>6</sub>
- 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 (N<sub>2</sub>O)
- Hydroxylamine (NH<sub>2</sub>OH)
- Dimethylsulphide (DMS), Dimethylsulphoniopropionate (p/d DMSP)
- Hydrogenperoxide (H<sub>2</sub>O<sub>2</sub>)
- 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 (<sup>3</sup>H-leucine uptake)

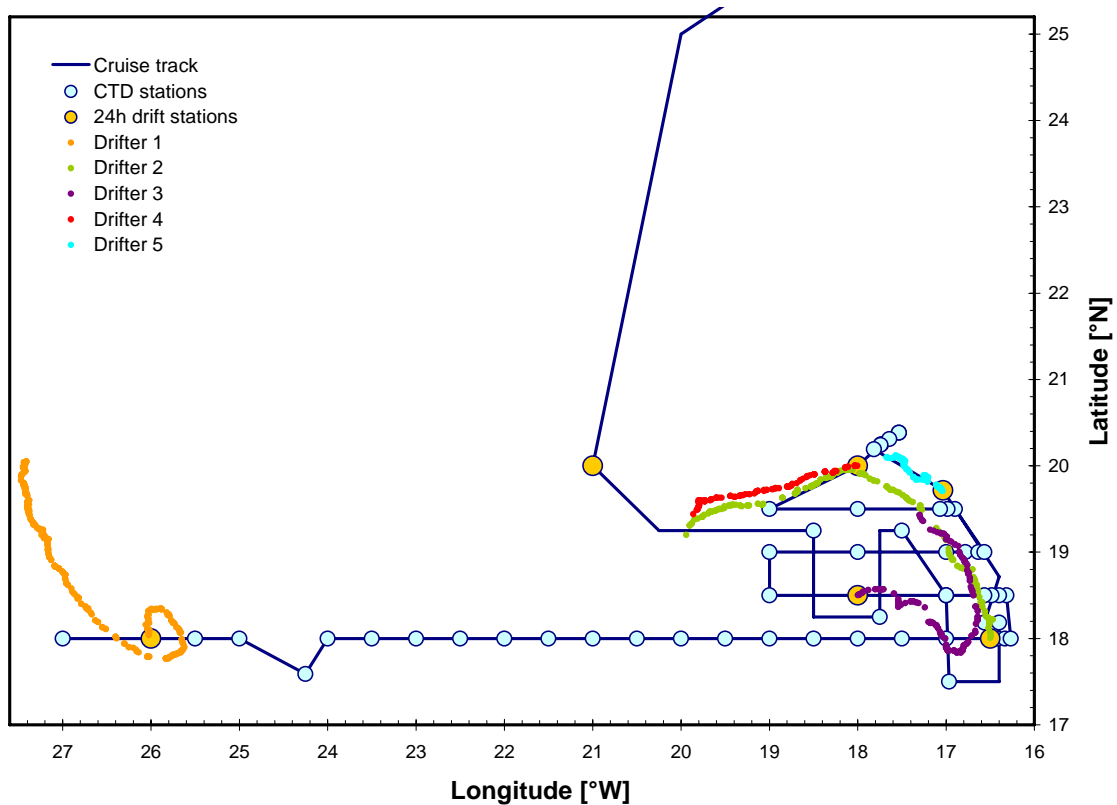
- Primary production ( $^{14}\text{C}$  uptake)

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  $\text{CO}_2$  detection,
- Continuous  $p\text{CO}_2$  measurements using a novel submersible sensor with membrane equilibrator and NDIR  $\text{CO}_2$  detection (by Pro-Oceanus Inc., Halifax/Canada),
- Continuous  $\text{O}_2$  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  $\text{N}_2\text{O}$  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 forecandle. 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 ( $\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{Br}$ ,  $\text{CH}_3\text{I}$ );
- 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