CRUISE REPORT POLARSTERN ANT-XXIV/3

6 February to 16 April 2008

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From Cape Town to Neumayer Station

POLARSTERN left Cape Town on 10 February 2008. Observations started with instruments which are applied from the moving ship with the acoustic profiling current meter (ADCP) and the thermosalinograph among the first to provide data. Then, pumps started to inject seawater from a snorkel in the keel of the ship into the pipes to the labs for analysis and for those who need particularly clean water a fish was used to pump seawater from a certain distance onto the ship.

The first stop was dedicated to recover a PIES (Pressure inverted echosounder) which moored on the sea floor recorded variations in the sea level elevation and the sound velocity in the water column. It was the first one of a set of those instruments to be recovered and moored again. Then, a test station for the ultra-clean CTD followed. It was brought onboard by a group from the Netherlands Institute of Sea Research (NIOZ). It is supposed to take samples which enable scientists to measure the concentration of dissolved iron in the water.

On 11 February we crossed the course of the Norwegian research vessel G.O. SARS, which was on its way back to Cape Town from a cruise on which two German colleagues participated. In spite of having a common programme with PIES in the Southern Ocean, we had to restrict ourselves to waving the arms, blowing the horns and a subsequent email exchange of slides taken of each of us, since we could not afford to loose further time on our way to the South.

The next test station aimed on the CTD probe (conductivity, temperature depth) with the rosette water sampler. Here, as well, the test was performed successfully and water samples and data could be used for the programme. Weather slowed us down when a low pressure system passed nearby providing us with winds of up to 10 Bft.

In this northern part of our operation area station work and steaming alternate with a distance of almost 100 nm, weather and sea permitting, since the focus of our work was south of the Polar Front. However, the gaps in the North will be closed via cooperation with the scientists on the French research vessel MARION DUFRESNE whose focus was on the northern region. Our cooperation in the context of the International Polar Year 2007/2008 will result in a comprehensive survey of the sea area between South Africa and Antarctica.

We had reached Antarctica on 25 February after having crossed 60°S and entered our main operation area when we crossed the northern limb of the Weddell gyre. Air temperatures decreased to near to 0°C and scattered snowfall occurred. The wind fluctuated from 6 to 8 Bft. Significant numbers of icebergs were encountered which drifted with the northern limb of the Weddell gyre.
At super stations a full suite of water sampling devices with at times more than 10 casts was operated including the CTD/rosette water sampler, the ultra-clean sampler and in-situ pumps. They all are needed to fulfil the requirements of the GEOTRACES community and take up to 20 hours per station.

Deployment of vertically profiling floats(Argo-Floats) continued to add to the world wide network with a significant part of the floats being provided by Stephen Riser from the University of Washington. These floats are supposed to drift with the Antarctic Circumpolar Current into the Indian Ocean. Underway we recovered 6 and redeployed 5 PIES. Unfortunately one of the instruments was lost upon recovery. These instruments measure the fluctuations of the Antarctic Circumpolar Current.

The mooring work started with the successful recovery of three moorings in the transition zone from the Antarctic Circumpolar Current to the Weddell gyre, which were supposed to measure the exchanges between the two current systems. Unfortunately these moorings could not be redeployed because of the critical funding situation and the project has to be terminated.

The accident

On 2 March we reached the Atka Bight in the early hours of Sunday morning, after we had left the operation area on the Greenwich meridian on 28 February. After greyish and partly stormy days we were greeted with Sunday weather in the most literal sense of the word. Everybody was excited, after days of tiring station routine, to enjoy one day on the ice with all the impressions that renders Antarctic research so particularly fascinating. Despite the fact that the scientists had to take into account that they must assist with the loading and pumping work there should still be sufficient time to enjoy the stay on the ice.

However when we received at 8.30 am, the news that a helicopter has crashed during the transport of personnel to the Neumayer Station the pleasure of anticipation and expectation altered to shock and grief. The rescue teams from the Neumayer III construction site and the Neumayer station quickly arrived at the crash site and had to report the deaths of the pilot Stefan Winter and of one of our colleagues from NIOZ, Willem Polman. The three other passengers were seriously injured. The injured people were transported as quickly as possible with the second helicopter to the hospital on POLARSTERN where they were cared for. Due to effective international cooperation, the injured people could return without further delay via Cape Town into their homes.

Our stay at the Station was aimed at supply; we mainly had to supply fuel and food. Additionally, the valuable ice cores, which were drilled at the Kohnen Station, used material and garbage, came on board. Furthermore containers had to be rearranged, to provide space and material, which will be used during the forthcoming part of the cruise. For this purpose, freight containers had to be moved from the hatch onto the ice, the hatches then had to be opened and lab containers had to be offloaded. Once all these containers were on sledges on the ice, to remove them from the loading area, they were, together with the additional freight containers, then carried back and reloaded in a new sequence. A shunting yard on the shelf ice. Simultaneously, fuel was pumped into the tank containers. The good weather facilitated the work.

The completion of the work on the Greenwich meridian

The work on the Greenwich meridian was determined by an alternating sequence of casts with the oceanographic and the ultra clean CTD every 30 nautical miles. Slowly the hydrographic structure of the Weddell Gyre appeared in our observations, which we had crossed until the time of leaving to the Neumayer Station up to the foot area of Maud Rise at 65°30'S. A longer phase with relatively weak winds was favourable to this progress. We completed 7 „Super stations" in the context of the GEOTRACES-Programme, 25 ultra-clean CTD and 73 normal CTD stations to cover all hydrographic regions on the Greenwich meridian with all the relevant parameters. We have recovered 9 moorings and redeployed 5 of them. Two sound sources were recovered and redeployed. The grid of vertically profiling floats was extended by 38 and these will now drift under the sea ice of the forthcoming autumn and winter.

At the last mooring at about 12 nm north of the edge of the Fimbul Ice Shelf, we encountered a new challenge. When we tried to interrogate the acoustic releases with the Posidonia system onboard POLARSTERN no reply was received. So we released blindly and waited for the mooring to show up at the surface. But when we received a message from Bremerhaven that the transmitter had reached the surface shortly after the release signal, though 7 nm away from the expected position, we turned immediately towards the indicated position and recovered the mooring quickly. It has been removed by an iceberg to a position. It is a great success that all moorings on the Greenwich meridian were recovered after the first 3-year-mooring period, which proves that our mooring technology has reached a standard which allows us to plan such long deployment periods in future.

On 12 March the work on the Greenwich meridian was terminated and we steamed towards the Weddell Sea.

In the Weddell Sea

The sea ice conditions in the eastern Weddell Sea were determined by a pronounced tongue of sea ice emerging from the South. Since we needed to save time due to the events at the Neumayer Station, we omitted the eastern part of the transect from Kapp Norvegia to Joinville Island. As an alternative it was planned to circumnavigate the tongue in the North to gain by easier conditions and omitting station work the required time. However the ice conditions became much more serious and this plan was only partially successful. We had to increase the station distance to 45 nm. The first station on the transect occurred on 15 March at 69°22'S 16°21'W.

As on the Greenwich meridian, the rhythm of the programme was given by the sequence of lowering and hoisting of the „normal" and ultra-clean CTDs. The deployment of sound sources is of particular interest. To obtain measurements in the winter and under the ice, floats were developed which drift at 800 m depths. Once every 10 days they descend first to 2000 m depth and then return to the surface. If there, they are informed of their position and they transfer the measured data by satellites. So far, this is the global Argo system, in the context of which about 3000 such floats operate in the open ocean and to which we are contributing. However, under the ice this procedure does not work because the floats are not able to reach the surface. For this reason our floats are located by means of the sound sources and the travel times of the signals they transmit. They recognize that they are under the ice because the near surface water temperature is close to the freezing point. Then they stop their ascent and return to depth again. When they reach open water again, they transmit the full recorded data set. A special challenge is the recovery of moorings under heavy ice conditions. However, after our first deployment period of three years, we were able to recover all moorings. Unfortunately the instruments technology is not as far developed as our mooring technology. Therefore in spite of a 100% recovery rate, we did not achieve a 100% data rate.

To finalized the transect across the Weddell Sea, we needed a lot of patience since the sea ice conditions in the Weddell Sea are extreme. Over the summer two large ice tongues stretched from the southern to the northeastern and the northwestern Weddell Sea. This wider than normal ice extent during the year is consistent with a trend visible in the time series of NSIDC derived from satellite images of increasing sea ice extent in summer during the last decades. However, this does not mean a real increase but only a weaker melting in summer because the winter sea extent remained basically constant. For us, this situation is not only a challenge to be explained but it had direct consequences on the cruise. The onset of ice formation in

autumn gave rise to unexpected heavy ice conditions very similar to winter conditions. Heavy ice resulted in lower speed and less time available, as the original plan was based on mean sea ice conditions. The loss of time has to be compensated through reduction of station times by increasing the station distances. Increasing station distance increases the uncertainty of the estimates of the intensity of variations. In spite of the restrictions, it was possible to probe the relevant water masses sufficiently to detect the correlation of longterm variations in the Weddell Sea and those at the Greenwich meridian. The concentrations of trace substances were measured in an unprecedented manner.

In the Weddell Sea we completed 1 „Super stations“ in the context of the GEOTRACES-Programme, 15 ultra-clean CTD and 45 normal CTD stations which covered the central and the western part. We have recovered 3 moorings and redeployed 8 of them. Three sound sources were recovered and 4 deployed. Unfortunately we had to take note that two of the recovered sound sources had failed. The grid of vertically profiling floats was extended by 16 and these will now drift under the sea ice of the forthcoming autumn and winter.

King George Island and Drake Passage

On 30 March we arrived at King George Island after having crossed serious ice conditions north of Joinville Island. We took freight on board, both here and from the stations Frei and Jubany. A group of seven French and one Chilean scientist were waiting at the Russian station Bellingshausen and two Korean scientists were waiting at the Korean station King Sejong to come on board for the rest of the cruise. Since the flight from King George Island to Punta Arenas was cancelled, the group who was supposed to return from here had to stay onboard until the end of the cruise. We steamed to Drake Passage where an intensive mooring programme took place in addition to the continuation of our measurements of water mass properties and concentration of trace substances.

The work was focussed on the French/Korean mooring programme. We intended to recover 10 moorings and redeploy 5 of them. While the first two moorings of the Korean group in the southern Drake Passage could be recovered in spite of the unfavourable weather conditions with no problems, there was a problem with the flotation of the moorings we needed to recover further north. Most of them had still enough buoyancy to ascend to the surface. However, some of them did so at a rather slow rate. In spite of the fact that they could be monitored by Posidonia, this required a lot of patience. Two of the moorings ascended but did not reach the surface. With time consuming operations we tried to dredge them, by paying out about 5000 m of wire which we towed in loops around them. Still, our efforts were not successful. No matter which way we placed our loops (which was not easy with 6 to 7 Bft) the moorings escaped and, disappointed, we had to give up the recovery.

In Drake Passage we completed 5 „Super stations“ in the context of the GEOTRACES-Programme, 12 ultra-clean CTD and 46 normal CTD stations. We have recovered 8 moorings and redeployed 5 of them. The grid of vertically profiling floats was extended by 14 floats.

The time lost to the problems with the moorings had to be regained by the reduction of the CTD work which resulted in a coarser resolution. Still we were lucky because Drake Passage with famous Cape Hoorn did not show us it’s most uncomfortable side. Really bad weather only reached us only at the end of the mooring work when we returned to the south to fill in omitted CTD stations. To avoid the bad weather the last CTD station occurred at 56° 01.07’S.

When the bad weather arrived we were already steaming towards Le Maire Strait with the wind at our back.

On 3 April, we had left Antarctica, when we passed 60° S. On 16 April, the cruise ended according to the plan in Punta Arenas.

Epilog

Our cruise was mainly dedicated to the investigation of the oceanic circulation and the biogeochemical processes with their influence on life that depends on them. The main programmes occurred in the context of the International Polar Year 2007/2008 (IPY). The IPY was established under the auspices of ICSU and WMO. It aims to coordinate forces globally to achieve a quasi-synoptic survey of the conditions in both polar areas to obtain a benchmark for future changes. In the GEOTRACES project the role of traces substances in the context of biogeochemical cycles is investigated. The CASO project (Climate of Antarctica and the Southern Ocean) takes up work which had started in the WECCON project (Weddell Sea convection control). It aims to investigate processes which occur in the Atlantic Sector of the Southern Ocean and Drake Passage in cooperation with the Bjerknes Centre for Climate Research in Bergen, Norway and the British Antarctic Survey (BAS). In the framework of iAnZone, a programme associated to SCOR (Scientific Committee of Oceanographic Research) and its IPY SASSI project (Synoptic Antarctic Shelf Slope Interactions Study) observation occurred in the area of Maud Rise and the Antarctic Coastal Current. The observations occurred jointly with the IPY GOOD-HOPE project which covers the northern part of the Atlantic sector of the Southern Ocean. The part of the cruise in Drake Passage is part of the French programme DRAKE. The global impact of the regional Processes will be considered in the BIAC (Bipolar Atlantic Thermohaline Circulation) IPY project. The cruise occurs in the context of the MARCOPOLI programme of the Hermann von Helmholtz Association of German Research Centres (HGF). It is a contribution to the Climate Variability and Predictability (CLIVAR) and the Climate and Cryosphere (CliC) projects of the World Climate Research Programme (WCRP). The ULSs are a contribution to the Antarctic Sea Ice Thickness Project (AnSITP). The deployment of floats occurs in the framework of the international Argo programme which contributes to the Global Ocean Observing System (GOOS).

As a contribution to the International Polar Year 2007/2008 the cruise was part of the CASO - (Climate of Antarctica and the Southern Ocean) and the GEOTRACES projects. It was the aim to measure ocean currents, temperature, salinity and concentrations of many trace substances in the Southern Ocean. The descending motions in the Southern Ocean are part of the world wide oceanic overturning circulation. They affect the role of the ocean in climate change and biogeochemical cycles. Our measurements raise the question as to whether the deep reaching, descending motion of the overturning, increases again after a phase of slackening. For more than a decade we have observed that the temperatures in the deep Weddell Sea were rising which suggested the reduction of the deep reaching water mass formation in the Antarctic Ocean. Now the temperature is decreasing again. This occurs at a time when sea ice extent in summer is increasing and shows clearly that the potential influence of global warming is not simply to identify from the background of decadal variations.

It is of special interest, that the evaluation of satellite data by NSIDC indicated clearly that the Antarctic summer 2007/2008 was the one with the largest ice extent on record. This trend which is particularly strong in the Atlantic sector of the Southern Ocean is in clear contrast to

the Arctic where a strong decrease of the summer ice extend is observed. To understand the opposing trends in the Antarctic and the Arctic is an obvious aim of our cruise. Because those changes occur over decades and are subject to significant spatial variations the ships cruises like the one of POLARSTERN are not enough to track them with sufficient accuracy. Therefore we need comprehensive autonomous observing systems which can be moored or feely drifting. They are a component of the Southern Ocean Observing System (SOOS) which is under development these days. As a contribution to such a system we deployed, in international cooperation, 18 moored systems and recovered 20 of them. With the recording period of three years we have reached a record length. We deployed 68 floats, the ones which were deployed in the Weddell Sea are able to operate under the ice. They have an operation period of up to five years and form a network of unprecedented coverage of this part of the earth.

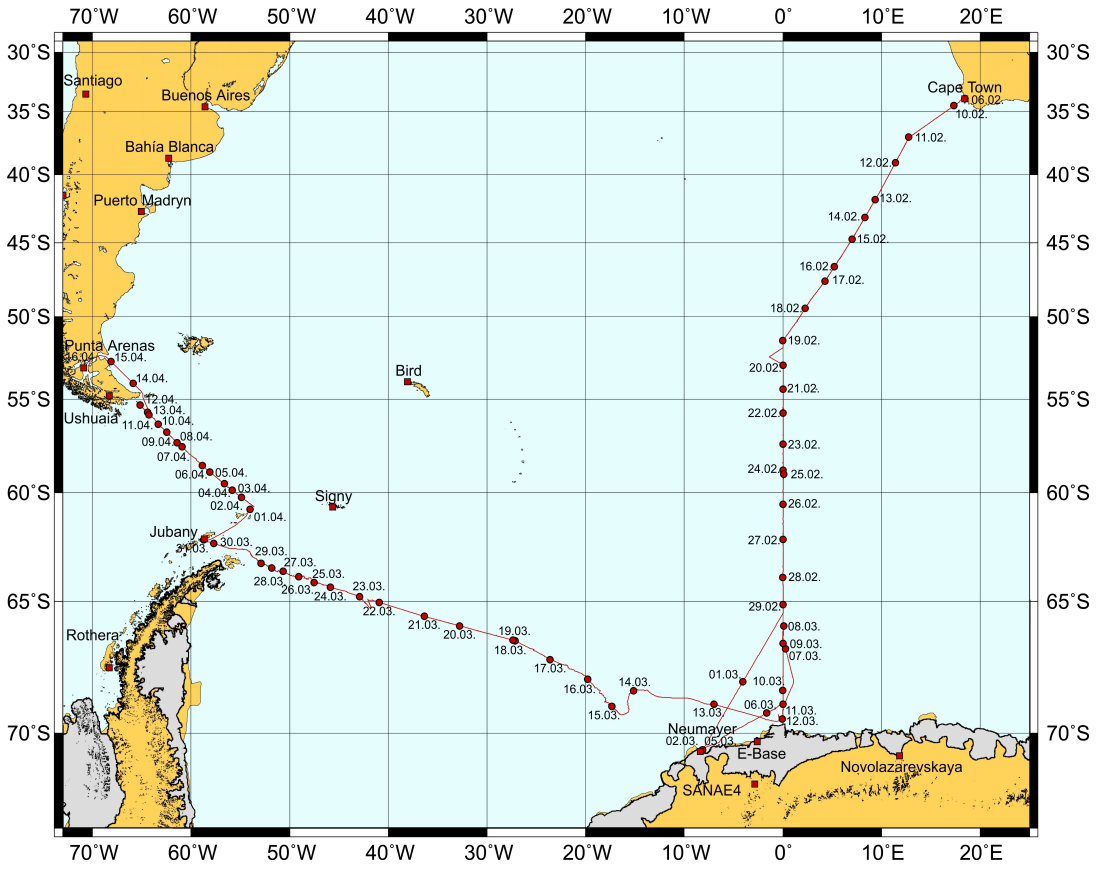

Fig. 1: Cruise track during POLARSTERN leg ANT-XXIV/3 from 6 February to 16 April 2008.

POLARSTERN ANT XXIV-3
PS71/097-2 is Polarstern cruise 71, station 097, Cast 2.

THIS IS FINAL VERSION OF STATION NUMBERS AND CAST NUMBERS
WARNING: THESE NUMBERS MAY DIFFER FROM PROVISIONAL STATION/CAST NUMBERS ON YOUR SAMPLE BOTTLES

		Cast Leader
	CTD/RO is regular CTD Rosette with 22 NISKIN-type samplers	
B1	**CTD/RO Deep Hydrocasts for ALK, DIC, CFC's, 234Th, Silicon-isotopes are yellow highlighted**	**Oliver Huhn**
C	**CTD/RO Deep Hydrocasts for eight (8) large 20 Litre samples for 231Pa/230Th/Nd (plus 60 L for Hf) is purple highlighted**	**Celia Venciarutti**
D	**CTD/RO hydrocasts to 200m and to 1000m are for 210Po/210Pb and are red highlighted**	**Maya Robert**
F	**CTD/RO Hydrocast for four (4) large volumes (circa 60 L) samples for Hafnium**	**Torben Stichel**
A2	**CTD/RO shallow hydrocast for virus exps., phyto exps., fast-equilbr.exps., 234Th, Si-isotopes, (Hafnium)**	**Anne-Carlijn Alderkamp**
	PS71-132-3 is special hydrocast for testing dissolved O2 method	**Ismael Nunez-Riboni**
	PS71-154-1 and PS71-155-1 are two special hydrocasts in Atka Bay, near Neumayer station	
	CTD/UC is Ultraclean Titanium frame with 24 GOFLO samplers used for trace metals	
A1	**CTD/UC Deep Hydrocasts for Trace Metals (often also for DIC, ALK) are lightblue highlighted**	**Patrick Laan / Hein de Baar**
B2	**One large volume of 240 L for start biological experiment**	**Babette Bontes**
G	**Ultraclean shallow 300-400m depth casts G1 through G5 for Iron Isotopes when approaching Antarctic Peninsula**	**Hein de Baar**

Major nutrients are analysed for each sampler of deep hydrocasts A1 and B1 (silicate, phosphate, nitrite, nitrate+nitrite)
Date and time is UCT (formerly called GMT, Greenwich Mean Time, in old days when Brittania still thought it ruled the waves)

	PS71/107-1	18.02.08	18:16	50° 9.50' S	1° 32.36' E	3642.1	Mooring	MOR	released	by Heli
	PS71/107-2	18.02.08	19:18	50° 15.47' S	1° 26.31' E	3864.2	Mooring	MOR	surface	
	PS71/107-2	18.02.08	19:19	50° 15.47' S	1° 26.33' E	3864.5	Mooring	MOR	slipped	
	PS71/107-1	18.02.08	19:29	50° 15.60' S	1° 26.37' E	3865.1	Mooring	MOR	on the surface	
	PS71/107-1	18.02.08	19:46	50° 16.06' S	1° 26.56' E	3860.5	Mooring	MOR	on deck	
A1	PS71/107-3	18.02.08	19:57	50° 16.13' S	1° 26.71' E	3855.0	CTD, Ultra	CTD/UC	into Water	
A1	PS71/107-3	18.02.08	20:59	50° 16.29' S	1° 27.02' E	3840.6	CTD, Ultra	CTD/UC	on Depth	3700 m
A1	PS71/107-3	18.02.08	22:33	50° 16.94' S	1° 27.83' E	3816.0	CTD, Ultra	CTD/UC	on Deck	
	PS71/107-4	18.02.08	22:39	50° 16.98' S	1° 27.98' E	3804.9	FLOAT	FLOAT	into water	
A2	PS71/108-1	19.02.08	08:44	51° 29.96' S	0° 0.19' E	2768.2	CTD/rosett	CTD/RO	surface	
A2	PS71/108-1	19.02.08	08:53	51° 29.95' S	0° 0.43' E	2761.6	CTD/rosett	CTD/RO	at depth	
A2	PS71/108-1	19.02.08	09:08	51° 30.01' S	0° 0.57' E	2761.0	CTD/rosett	CTD/RO	on deck	
B1	PS71/108-2	19.02.08	09:38	51° 29.84' S	0° 0.31' E	2758.5	CTD/rosett	CTD/RO	surface	
	PS71/108-3	19.02.08	09:53	51° 29.88' S	0° 0.34' E	2761.0	Hand net	HN	surface	
	PS71/108-3	19.02.08	10:01	51° 29.89' S	0° 0.37' E	2761.4	Hand net	HN	on deck	
B1	PS71/108-2	19.02.08	10:41	51° 29.91' S	0° 0.21' E	2771.7	CTD/rosett	CTD/RO	at depth	2704m
B1	PS71/108-2	19.02.08	11:48	51° 29.95' S	0° 0.02' W	2775.4	CTD/rosett	CTD/RO	on deck	
	PS71/108-4	19.02.08	11:52	51° 29.97' S	0° 0.02' W	2784.1	FLOAT	FLOAT	into water	
	PS71/109-1	19.02.08	11:56	51° 30.19' S	0° 0.17' W	2793.1	Iron Fish	IFISH	surface	
	PS71/109-1	19.02.08	15:38	51° 56.55' S	0° 0.72' E	2846.0	Iron Fish	IFISH	on deck	
A1	PS71/110-1	19.02.08	15:44	51° 56.66' S	0° 0.65' E	2852.8	CTD, Ultra	CTD/UC	into Water	
A1	PS71/110-1	19.02.08	16:32	51° 56.76' S	0° 0.77' E	2856.5	CTD, Ultra	CTD/UC	on Depth	sl 2700m
A1	PS71/110-1	19.02.08	17:42	51° 56.75' S	0° 0.84' E	2858.3	CTD, Ultra	CTD/UC	on Deck	
	PS71/110-2	19.02.08	17:45	51° 56.75' S	0° 0.84' E	2858.9	FLOAT	FLOAT	into water	
	PS71/111-1	19.02.08	17:51	51° 56.97' S	0° 0.36' E	2861.4	Iron Fish	IFISH	surface	
	PS71/111-1	20.02.08	00:55	52° 30.28' S	1° 23.96' W	2794.2	Iron Fish	IFISH	on deck	
B1	PS71/112-1	20.02.08	01:07	52° 30.38' S	1° 23.91' W	2801.2	CTD/rosett	CTD/RO	surface	

B1	PS71/112-1	20.02.08	02:06	52° 30.30' S	1° 23.03' W	2852.2	CTD/rosett	CTD/RO	at depth	2800 m	
	PS71/112-2	20.02.08	02:07	52° 30.30' S	1° 23.02' W	2852.6	Pressure Ir	PIES	information	hydrofon zu wasser	
	PS71/112-2	20.02.08	02:09	52° 30.29' S	1° 22.99' W	2853.9	Pressure Ir	PIES	Release		
	PS71/112-2	20.02.08	02:17	52° 30.30' S	1° 22.87' W	2860.6	Pressure Ir	PIES	information	hydrofon an deck	
	PS71/112-2	20.02.08	02:52	52° 30.24' S	1° 22.27' W	2816.3	Pressure Ir	PIES	Surface		
B1	PS71/112-1	20.02.08	02:59	52° 30.20' S	1° 22.26' W	2811.4	CTD/rosett	CTD/RO	on deck		
	PS71/112-2	20.02.08	03:24	52° 30.24' S	1° 23.67' W	2803.5	Pressure Ir	PIES	on Deck		
	PS71/112-3	20.02.08	03:28	52° 30.23' S	1° 23.75' W	2799.8	FLOAT	FLOAT	into water		
	PS71/113	**START SUPERSTATION**									
D	PS71/113-1	20.02.08	10:28	53° 0.03' S	0° 0.43' E	2525.5	CTD/rosett	CTD/RO	surface		
D	PS71/113-1	20.02.08	10:55	52° 59.92' S	0° 0.81' E	2529.5	CTD/rosett	CTD/RO	at depth	994m	
	PS71/113-2	20.02.08	11:02	52° 59.90' S	0° 0.89' E	2530.3	Hand net	HN	surface		
	PS71/113-2	20.02.08	11:09	52° 59.89' S	0° 0.98' E	2529.5	Hand net	HN	on deck		
D	PS71/113-1	20.02.08	11:19	52° 59.88' S	0° 1.11' E	2539.3	CTD/rosett	CTD/RO	on deck		
A1	PS71/113-3	20.02.08	11:25	52° 59.87' S	0° 1.19' E	2522.4	CTD, Ultra	CTD/UC	into Water		**Cd isotopes**
A1	PS71/113-3	20.02.08	12:06	52° 59.81' S	0° 1.70' E	2520.9	CTD, Ultra	CTD/UC	on Depth	2351 m	**Cd isotopes**
A1	PS71/113-3	20.02.08	13:14	52° 59.75' S	0° 2.30' E	2522.4	CTD, Ultra	CTD/UC	on Deck		**Cd isotopes**
C	PS71/113-4	20.02.08	13:27	52° 59.58' S	0° 2.39' E	2544.2	CTD/rosett	CTD/RO	surface		3 duplicates to compare with BonusGoodHope
C	PS71/113-4	20.02.08	14:27	52° 59.55' S	0° 2.72' E	2517.3	CTD/rosett	CTD/RO	at depth	EL 31 2462 m	3 duplicates to compare with BonusGoodHope
C	PS71/113-4	20.02.08	15:17	52° 59.67' S	0° 2.65' E	2506.1	CTD/rosett	CTD/RO	on deck		3 duplicates to compare with BonusGoodHope
	PS71/113-5	20.02.08	15:23	52° 59.70' S	0° 2.66' E	2504.2	In situ pum	ISP	into water	Ankerstein	
	PS71/113-5	20.02.08	15:29	52° 59.73' S	0° 2.68' E	2503.5	In situ pum	ISP	into water	1.Pumpe	
	PS71/113-5	20.02.08	15:36	52° 59.76' S	0° 2.69' E	2502.9	In situ pum	ISP	into water	2.Pumpe	
	PS71/113-5	20.02.08	15:42	52° 59.77' S	0° 2.69' E	2503.2	In situ pum	ISP	into water	3.Pumpe	
	PS71/113-5	20.02.08	15:51	52° 59.77' S	0° 2.67' E	2505.3	In situ pum	ISP	into water	4. Pumpe	
	PS71/113-5	20.02.08	15:55	52° 59.78' S	0° 2.67' E	2504.9	In situ pum	ISP	into water	5. Pumpe	
	PS71/113-5	20.02.08	16:00	52° 59.79' S	0° 2.67' E	2505.3	In situ pum	ISP	into water	6. Pumpe	
	PS71/113-5	20.02.08	16:01	52° 59.79' S	0° 2.67' E	2505.3	In situ pum	ISP	pump at de	SI 1020	
	PS71/113-5	20.02.08	19:33	53° 1.09' S	0° 3.19' E	2454.4	In situ pum	ISP	on deck	Pumpe 6	
	PS71/113-5	20.02.08	19:36	53° 1.12' S	0° 3.19' E	2455.7	In situ pum	ISP	on deck	Pumpe 5	
	PS71/113-5	20.02.08	19:39	53° 1.14' S	0° 3.19' E	2456.1	In situ pum	ISP	on deck	Pumpe 4	
	PS71/113-5	20.02.08	19:46	53° 1.19' S	0° 3.20' E	2458.8	In situ pum	ISP	on deck	Pumpe 3	
	PS71/113-5	20.02.08	19:53	53° 1.23' S	0° 3.24' E	2456.1	In situ pum	ISP	on deck	Pumpe 2	
	PS71/113-5	20.02.08	20:01	53° 1.27' S	0° 3.28' E	2448.5	In situ pum	ISP	on deck	Pumpe 1	
	PS71/113-5	20.02.08	20:03	53° 1.27' S	0° 3.29' E	2442.8	In situ pum	ISP	on deck		
B2	PS71/113-6	20.02.08	20:15	53° 1.33' S	0° 3.33' E	2434.8	CTD, Ultra	CTD/UC	into Water		
B2	PS71/113-6	20.02.08	20:22	53° 1.37' S	0° 3.35' E	2429.9	CTD, Ultra	CTD/UC	on Depth	152m	
B2	PS71/113-6	20.02.08	20:42	53° 1.42' S	0° 3.36' E	2422.0	CTD, Ultra	CTD/UC	on Deck		
D	PS71/113-7	20.02.08	20:53	53° 1.44' S	0° 3.36' E	2423.4	CTD/rosett	CTD/RO	surface		
D	PS71/113-7	20.02.08	21:04	53° 1.49' S	0° 3.44' E	2361.6	CTD/rosett	CTD/RO	at depth	195m	
D	PS71/113-7	20.02.08	21:17	53° 1.57' S	0° 3.54' E	2350.9	CTD/rosett	CTD/RO	on deck		
	PS71/113	**END SUPERSTATION**									
	PS71/114-1	20.02.08	21:19	53° 1.57' S	0° 3.63' E	2347.7	Iron Fish	IFISH	surface		
	PS71/114-1	21.02.08	01:06	53° 31.21' S	0° 0.04' E	2630.3	Iron Fish	IFISH	on deck		
	PS71/115-1	21.02.08	01:13	53° 31.24' S	0° 0.04' E	2631.7	Pressure Ir	PIES	Start deployment		
	PS71/115-1	21.02.08	01:13	53° 31.24' S	0° 0.04' E	2631.7	Pressure Ir	PIES	End deployment		
B1	PS71/115-2	21.02.08	01:19	53° 31.25' S	0° 0.10' E	2631.4	CTD/rosett	CTD/RO	surface		7 duplicates Si isotopes to compare with BonusGoodHope
	PS71/115-1	21.02.08	01:47	53° 31.19' S	0° 0.23' E	2630.2	Pressure Ir	PIES	information	PIES am Grund	
B1	PS71/115-2	21.02.08	02:17	53° 31.12' S	0° 0.37' E	2643.9	CTD/rosett	CTD/RO	at depth	2590 Meter	7 duplicates Si isotopes to compare with BonusGoodHope
B1	PS71/115-2	21.02.08	03:07	53° 30.95' S	0° 0.30' E	2657.7	CTD/rosett	CTD/RO	on deck		7 duplicates Si isotopes to compare with BonusGoodHope

A1	PS71/116-1	21.02.08	06:44	54° 0.07' S	0° 0.01' W	2529.5	CTD, Ultra	CTD/UC	into Water	
A1	PS71/116-1	21.02.08	07:28	53° 59.99' S	0° 0.02' W	2521.9	CTD, Ultra	CTD/UC	on Depth	SL 2400m
A1	PS71/116-1	21.02.08	08:42	53° 59.97' S	0° 0.01' E	2513.2	CTD, Ultra	CTD/UC	on Deck	
	PS71/117-1	21.02.08	08:51	54° 0.25' S	0° 0.06' W	2464.6	Iron Fish	IFISH	surface	
	PS71/117-1	21.02.08	12:43	54° 30.71' S	0° 2.39' E	1743.0	Iron Fish	IFISH	on deck	
	PS71/118-1	21.02.08	12:45	54° 30.77' S	0° 2.30' E	1743.0	Mooring	MOR	released	Rec 238-5
	PS71/118-1	21.02.08	13:15	54° 30.43' S	0° 1.60' E	1735.5	Mooring	MOR	action	Toppeinheit
	PS71/118-1	21.02.08	13:22	54° 30.41' S	0° 1.70' E	1738.4	Mooring	MOR	action	1 Benthospaket + Strömungsmesser
	PS71/118-1	21.02.08	13:25	54° 30.41' S	0° 1.69' E	1740.4	Mooring	MOR	action	CTD Rekorder
	PS71/118-1	21.02.08	13:28	54° 30.42' S	0° 1.66' E	1737.4	Mooring	MOR	action	CTD Rekorder
	PS71/118-1	21.02.08	13:31	54° 30.41' S	0° 1.71' E	1737.2	Mooring	MOR	action	Benthospaket + Strömungsmesser
	PS71/118-1	21.02.08	13:37	54° 30.42' S	0° 1.70' E	1738.4	Mooring	MOR	action	CTD-Rekorder
	PS71/118-1	21.02.08	13:41	54° 30.39' S	0° 1.58' E	1735.5	Mooring	MOR	action	Strömungsmesser + Auftriebspaket
	PS71/118-1	21.02.08	13:49	54° 30.36' S	0° 1.55' E	1733.1	Mooring	MOR	action	CTD-Rekorder
	PS71/118-1	21.02.08	13:55	54° 30.38' S	0° 1.55' E	1733.8	Mooring	MOR	action	CTD-Rekorder
	PS71/118-1	21.02.08	14:09	54° 30.39' S	0° 1.56' E	1734.2	Mooring	MOR	on deck	Mooring komplett
B1	PS71/118-2	21.02.08	14:29	54° 30.35' S	0° 2.37' E	1728.3	CTD/rosett	CTD/RO	surface	
B1	PS71/118-2	21.02.08	15:16	54° 30.20' S	0° 2.24' E	1750.5	CTD/rosett	CTD/RO	at depth	1714m
B1	PS71/118-2	21.02.08	15:58	54° 30.19' S	0° 1.76' E	1718.8	CTD/rosett	CTD/RO	on deck	
A1	PS71/119-1	21.02.08	20:01	55° 0.00' S	0° 0.05' E	1714.4	CTD, Ultra	CTD/UC	into Water	
A1	PS71/119-1	21.02.08	20:32	55° 0.14' S	0° 0.00' W	1729.3	CTD, Ultra	CTD/UC	on Depth	1652m
A1	PS71/119-1	21.02.08	21:35	55° 0.02' S	0° 0.15' E	1708.5	CTD, Ultra	CTD/UC	on Deck	
	PS71/120-1	21.02.08	21:46	55° 0.34' S	0° 0.36' E	1670.0	Iron Fish	IFISH	surface	