



Baltic Sea Research Institute Warnemünde

Cruise Report

r/v "Prof. A. Penck"

Cruise- No. 07PE/07/25

This report is based on preliminary data

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1. **Cruise No.:** 07PE/07/25
2. **Dates of the cruise:** from 23 Oct 2007 to 02 Nov 2007
3. **Particulars of the research vessel:**
Name: Prof. A. Penck
Nationality: Germany
Operating Authority: Baltic Sea Research Institute (BSRI) Warnemünde

4. **Geographical area in which ship has operated:**
Eastern Gotland Basin

5. **Dates and names of ports of call**
No Ports of call

6. **Purpose of the cruise**

The main purpose of this cruise was the sampling and tracking of an inert tracer that has been released in the deep waters of the Eastern Gotland Basin during an earlier cruise in September 2007. The overall scientific goal is to understand the processes determining the deep-water mixing in the Baltic Sea, and their role in vertical transport of dissolved substances. The tracer survey was accompanied by turbulence measurements with a microstructure profiler, as well as hydrographical measurements, CTD measurements, and acoustic current measurements with a vessel-mounted and a lowered ADCP.

7. **Crew:**

Name of master: G. Kasch
Number of crew: 9

Research staff:

Chief scientist: Dr. Lars Umlauf

Scientists: Dr. Oliver Schmale
Frank Schellig
Peter Holtermann
Gunda Wiczorek
Richard Hofmeister

Engineers: Ingo Schuffenhauer

Technicians: Susanne Lage
Katrin König

8. **Co-operating institutions:**
IFM-GEOMAR, Kiel, Germany

9. Scientific equipment

Seabird 911+ CTD

IOW Pump-CTD based on Seabird 911+ unit (not used)

RDI 300 kHz L-ADCP (mounted on CTD frame)

MSS90 microstructure profiler from ISW

Salinometer (Guideline Autosal B)

Shimadzu 2014 gas chromatograph + purge and trap system

General remarks and preliminary result (ca. 2 pages)

The scientific goal of this cruise, conducted in the framework of the DFG research project BaTRE, was to investigate deep-water mixing processes in the central Baltic Sea (Eastern Gotland Basin). To this end, during an earlier cruise carried out in September 2007, an inert tracer (SF_5CF_3) was injected into an isosurface of potential density 9.90 kg m^{-3} . This density surface was found to be located in the depth range 190-210 m. During following cruises, the present cruise being one example, the spreading of the tracer was and will be monitored by taking tracer samples on a dense spatial grid. The evolution of tracer in time and space will then provide essential information about the deep water spreading and mixing.

A total of 68 water stations were sampled for SF_5CF_3 in the water column. The 374 water samples were obtained by the use of the IOW CTD-rosette system equipped with 11 HYDRO-BIOS FreeFlow bottles. Subsequent water samples were taken with pre-cooled 100 ml glass syringes, stored in iced water buckets, and were generally examined within 1 hour after the sampling. 23 ampoules were taken for later analysis in the IOW laboratories. On board analyzed gas species (SF_5CF_3 and CFC12) were determined with the IOW purge and trap system. To this end, sub-samples of approximately 20 ml were transferred into the purge-vial. The dissolved gases were stripped with nitrogen (carrier gas) for 4.5 min. and subsequently concentrated on a 12 cm HaySep D (60/80 mesh) column installed into a CryoCooled Peltier Trap by -30°C . After that the Peltier Trap was heated to 120°C and the gases were transferred to a custom modified gas chromatograph (GC). This GC consists of, in series, a 15 cm Porasil C packed $1/8$ " column, a 180 Carbograph packed $1/8$ " column, a Molesieve (5A) $1/8$ " packed column and an Electron Capture Detector (ECD).

Test station TFE1

The scientific part of this cruise started with a short test at station TFE1 near the Darss area (for a station list, see below). The purpose of this station was (a) to provide practical training for the scientific crew, (b) to inter-compare instrument sensors, (c) to estimate station times and overhead for a typical measuring sequence. 3 CTD casts were taken at a local water depth of about 11 m. Bottles were filled during the last cast, and were later used to train syringe sampling. In addition, 11 MSS microstructure casts were taken for training purposes. The comparison between the Seabird and the MSS CTD units revealed large differences that could be traced back to a loose CTD pump hose. Due to this problem, a detailed sensor inter-comparison was postponed to station TT_01.

Cross-basin transect (stations TT_01 – TT_12)

At TT_01, a comparison between the Seabird and MSS CTD sensors was conducted. One mixed-layer cast was conducted with the MSS profiler attached to the CTD frame; two full-depth casts of the CTD and MSS systems followed immediately afterwards. Both casts revealed that the two Seabird temperature sensors agreed within 0.001 K, whereas the MSS CTD sensors showed up to 0.05 K higher values. This indicated that for the MSS CTD data a recalibration after the cruise is required.

The scientific purpose of the cross-basin transect “TT” (see Fig. 4) was to analyze the spatial homogeneity of the tracer. At each station, full-depth CTD profiles were taken, and during the down-cast a variable number (typically 4) of bottles were fired at prescribed density intervals around the target potential density of 9.90 kg m^{-3} . Tracer was found at almost all stations, however, with large concentration differences even on identical isopycnals. This indicated that lateral dispersion had not yet fully homogenized the tracer on isopycnals. At selected stations in the center and near the north-east end of the transect supplementary MSS microstructure casts were taken.

Basin-scale sampling grid (stations T3_001 – T3_050)

From the results of the cross-basin transect it was concluded that a grid with approximately 3m grid spacing (grid layout see Fig. 5 below) was a useful compromise between efficiency and resolution. At each grid point 4-9 water bottles were taken from a single full-depth CTD cast, and analyzed for tracer concentrations with the on-board analytical system. The CTD unit was equipped with a lowered ADCP (LADCP) system, therefore providing high-resolution full-depth profiles of current velocity and shear. Directly after (in a few cases also before) the CTD cast, microstructure measurements were carried out with the MSS90 profiler in so-called “burst mode” (typically 5 subsequent casts per station). The CTD casts confirmed the water column structure already found on the cross-basin transect (TT_01 – TT_12) with cold winter water underneath the surface mixing layer and a gradually weakening of the density gradient with increasing temperature and salinity towards the bottom.

Away from the boundary layers and below the halocline the MSS90 profiler revealed very low levels of turbulence, typically around $\varepsilon=10^{-9} \text{ W kg}^{-1}$, i.e. close to the noise level of the instrument. The surface mixing layer exhibited dissipation rates several orders of magnitude higher. The same applied to the bottom boundary layer with 1-2 orders of magnitude enhanced dissipation rates. The thickness of the bottom boundary layer was found to be of the order of meters. Boundary layer turbulence was strongest at stations close to the slopes of the basin. Interestingly, enhanced dissipation rates occurred also away from the boundary layers. We observed sporadic patches (2-10 m thick) with dissipation rates that were 1 (and sometimes up to 2) orders of magnitude larger than the background noise.

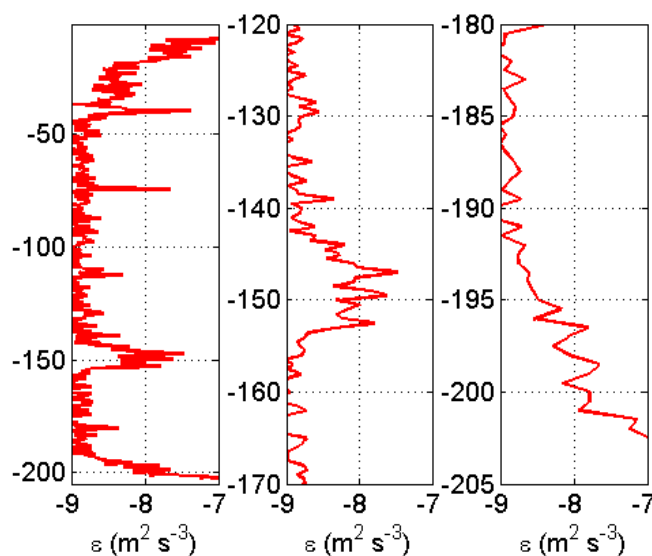


Fig. 1. Estimated dissipation rates at station T3_013 (see Fig. 5). Left panel shows full-depth profile. Center panel focuses on a turbulent patch at about 150 m depth, right panel focuses on the turbulent bottom boundary layer which intersects with the injection level at this location.

The tracer distribution on the measuring grid turned out to be patchy. Even on the target isopycnal, tracer concentrations varied by several orders of magnitude. Generally, tracer concentrations were stronger near the center of the basin and in the northern part. A typical example for a central station is displayed in Fig. 2, showing a pronounced vertical spreading. Boundary stations, i.e. those close to the 200 m isobaths, showed indication of stronger vertical mixing with tracer also found at comparatively low densities.

Due to increasing wind speeds CTD and microstructure sampling had to be interrupted after station T3_032. After some waiting time in the study area it was decided to approach a sheltering bay near the island of Gotland. After the wind speeds had sufficiently decreased, the Prof. A. Penck resumed the measuring program with station TT_038 (see Fig. 5). For the lack of time, however, from this point on microstructure measurements were canceled and only a limited number of bottle samples were analyzed on board (typically four). Based on the tracer content found in these samples, additional samples were sealed in ampoules for later analysis.

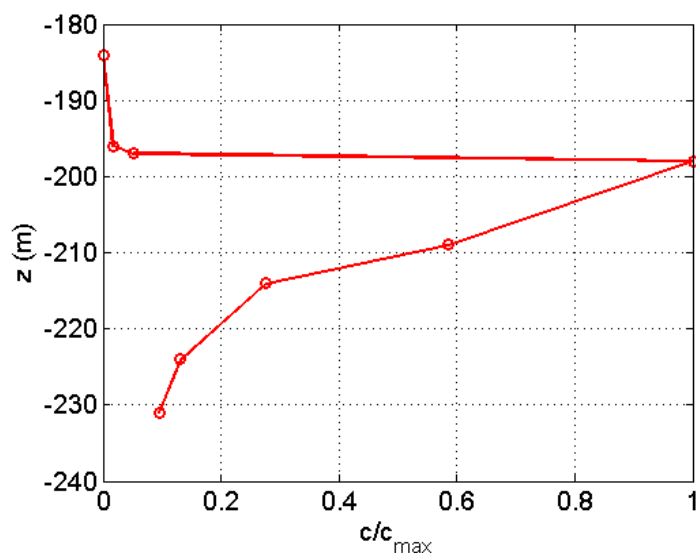


Fig. 2. Measured tracer concentration at station T3_17a (near the central station TF271, see Fig. 5). The injection level corresponds to a depth of approximately 200m.

After the station grid was completed, the ship proceeded to station SW (see Fig. 5) where a moored chain CTD chain with current meters was located. At this location repeated microstructure measurements were taken for approximately 7 hours (see table below) until the measurements had to be interrupted again due to increasing wind speeds. In accordance with the captain, and motivated by the fact that the weather report was not favorable with respect to further measurements, it was decided to terminate the measuring program ahead of time, and to return to Rostock harbor. The ship arrived in Rostock on 02 November by approximately 17:00 pm.

As a final remark, it should be pointed out that the cruise was shortly interrupted on the afternoon of the 30th October 2007 due to a fire in an AC plug in the hydro-lab at around 13:00 pm. The fire could be extinguished shortly after it broke out, however, it resulted in the formation of strong smoke on the deck that lasted for about 1 hour. No fire alarm was triggered. After a first inspection, no injuries and damage of equipment could be detected. The fire was attributed to a short circuit due to water penetrating through a porthole that was left open accidentally.

Appendix

1. Map of complete cruise track

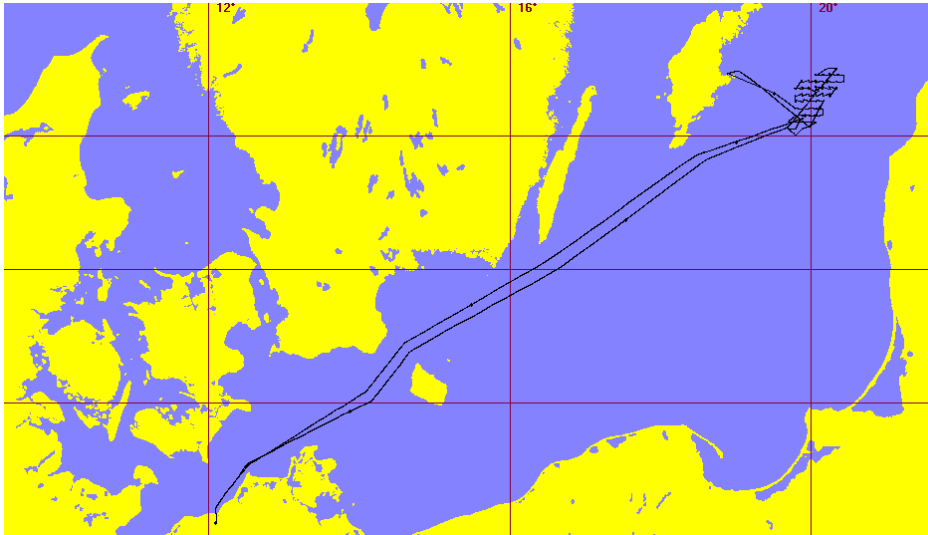


Fig 3. Cruise track according to on-board GPS system.

2. Station Maps

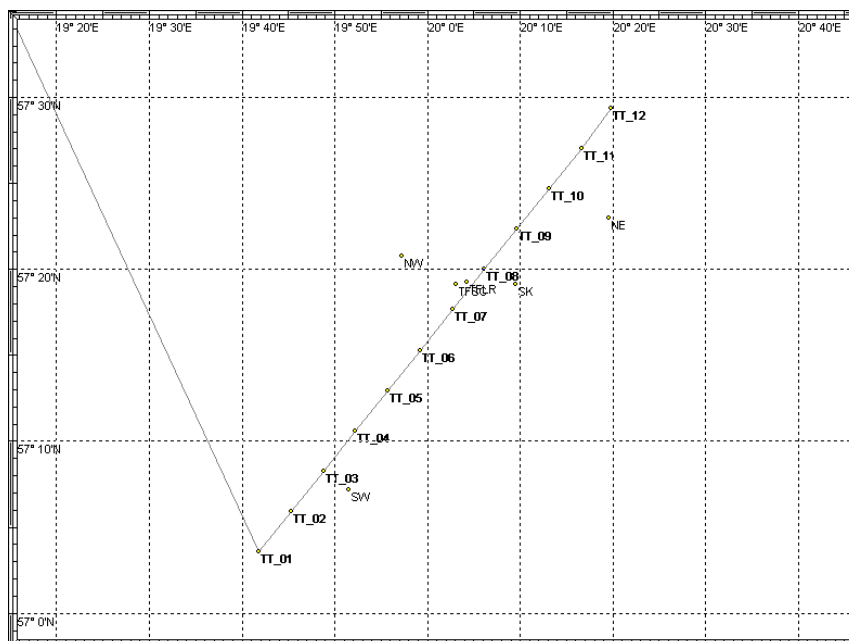


Fig. 4. Initial cross-basin transect for tracer search (see station table below).

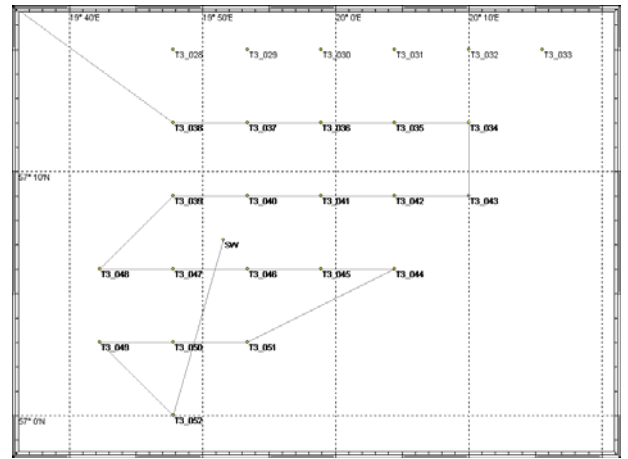
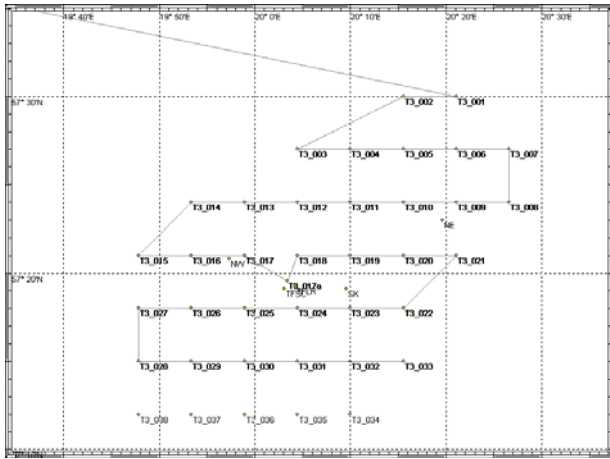


Fig. 5. Station grid with 3 nm spacing for tracer search (see station table below). Left panel shows cruise track continued after the wind event.

3. Station tables

Test station TFE1

Station	Name	Datum	Start (UTC)	Lat (deg)	Lat (min)	Lon (deg)	Lon (min)
	TFE1	23. Okt-07	09:13:35	54	23.5010 N	12	18.7230E

MSS-CTD Calibration

Station	Name	Datum	Start (UTC)	Lat (deg)	Lat (min)	Lon (deg)	Lon (min)
'0001	'TT_01	25. Okt 07	10:39:51	57	03.5830 N	19	41.7070E

Remark: Also cast 0002 in the next table was used for MSS-CTD Calibration

TT-Transect

Station	Name	Datum	Start (UTC)	Lat (deg)	Lat (min)	Lon (deg)	Lon (min)
'0002	'TT_01	25. Okt 07	11:23:52	57	03.5620 N	19	41.8780E
'0003	'TT_02	25. Okt 07	12:21:17	57	05.9180 N	19	45.4820E
'0004	'TT_03	25. Okt 07	13:26:57	57	08.2490 N	19	48.9330E
'0005	'TT_04	25. Okt 07	14:26:25	57	10.5940 N	19	52.3650E
'0006	'TT_05	25. Okt 07	15:21:14	57	13.0120 N	19	55.8070E
'0007	'TT_05	25. Okt 07	16:19:37	57	13.0950 N	19	55.7030E
'0008	'TT_06	25. Okt 07	17:36:39	57	15.5170 N	19	58.9080E
'0009	'TT_07	25. Okt 07	17:57:58	57	17.6440 N	20	02.6940E
'0010	'TT_08	25. Okt 07	20:06:41	57	20.0240 N	20	06.4080E
'0010	'TT_09	25. Okt 07	22:36:13	57	22.4550 N	20	09.3080E

'0011	'TT_10	26. Okt 07	00:01:19	57	N 24.6580	20	13.0900E
'0012	'TT_11	26. Okt 07	01:19:19	57	N 27.0300	20	16.7600E
'0013	'TT_12	26. Okt 07	02:29:03	57	N 29.3270	20	19.8880E

Station	Name	Datum	T3 Grid (first part)				
			Start (UTC)	Lat (deg)	Lat (min)	Lon (deg)	Lon (min)
'0014	'T3_001	26. Okt 07	03:26:44	57	29.9800 N	20	21.3090E
'0015	'T3_002	26. Okt 07	05:08:42	57	29.9370 N	20	15.4730E
'0016	'T3_003	26. Okt 07	07:12:41	57	26.9500 N	20	04.4220E
'0017	'T3_004	26. Okt 07	08:52:08	57	26.8520 N	20	10.1020E
'0018	'T3_005	26. Okt 07	10:43:16	57	26.9180 N	20	15.7680E
'0019	'T3_006	26. Okt 07	12:41:45	57	26.8470 N	20	21.3280E
'0020	'T3_007	26. Okt 07	14:28:45	57	26.9270 N	20	26.8700E
'0021	'T3_008	26. Okt 07	16:14:38	57	23.9390 N	20	26.8040E
'0022	'T3_008	26. Okt 07	17:20:49	57	24.1600 N	20	26.2850E
'0023	'T3_010	26. Okt 07	19:29:21	57	23.8610 N	20	15.6290E
'0024	'T3_011	26. Okt 07	21:10:39	57	23.8140 N	20	10.1460E
'0025	'T3_012	26. Okt 07	22:57:44	57	23.8830 N	20	04.4880E
'0026	'T3_013	27. Okt 07	00:37:00	57	23.7890 N	19	59.2090E
'0027	'T3_014	27. Okt 07	02:23:01	57	23.7840 N	19	53.6170E
'0028	'T3_015	27. Okt 07	04:19:37	57	20.7130 N	19	48.0550E
'0029	'T3_016	27. Okt 07	06:04:55	57	20.7380 N	19	53.6470E
'0030	'T3_017	27. Okt 07	07:53:15	57	20.7700 N	19	58.9880E
'0031	'T3_17a	27. Okt 07	13:34:29	57	19.7200 N	20	03.3240E
'0032	'T3_17a	27. Okt 07	13:35:38	57	19.6080 N	20	03.4090E
'0033	'T3_018	27. Okt 07	15:30:26	57	21.3840 N	20	04.0370E
'0034	'T3_019	27. Okt 07	17:01:28	57	20.7100 N	20	10.1540E
'0035	'T3_020	27. Okt 07	18:54:24	57	20.6580 N	20	15.7830E
'0036	'T3_021	27. Okt 07	21:01:21	57	20.7330 N	20	21.2700E
'0037	'T3_022	27. Okt 07	23:15:53	57	17.8070 N	20	15.7970E
'0038	'T3_023	28. Okt 07	01:23:23	57	17.7640 N	20	10.0910E
'0039	'T3_024	28. Okt 07	03:41:12	57	17.7310 N	20	04.4590E

'0040	'T3_025	28. Okt 07	06:00:09	57	N 17.7220	19	58.8180E
'0041	'T3_026	28. Okt 07	07:50:06	57	N 17.6920	19	53.4160E
'0042	'T3_027	28. Okt 07	09:26:14	57	N 17.5050	19	47.8340E
'0043	'T3_028	28. Okt 07	10:58:22	57	N 14.8370	19	47.9940E
'0044	'T3_029	28. Okt 07	12:43:12	57	N 14.8560	19	53.3670E
'0045	'T3_030	28. Okt 07	14:30:49	57	N 14.9960	19	59.0000E
'0046	'T3_031	28. Okt 07	16:30:02	57	N 15.0140	20	04.5670E
'0047	'T3_032	28. Okt 07	18:19:47	57	N 15.2060	20	10.2140E

Station	Name	Datum	T3 Grid (second part)		Lat (min)	Lon (deg)	Lon (min)
			Start (UTC)	Lat (deg)			
'0048	'T3_038	30. Okt 07	16:21:44	57	N 11.9250	19	47.7610E
'0049	'T3_037	30. Okt 07	17:22:18	57	N 11.9550	19	53.0900E
'0050	'T3_036	30. Okt 07	18:21:22	57	N 12.0300	19	58.8440E
'0051	'T3_035	30. Okt 07	19:23:21	57	N 11.8900	20	04.2000E
'0052	'T3_034	30. Okt 07	20:15:41	57	N 11.8820	20	09.7890E
'0053	'T3_043	30. Okt 07	21:11:11	57	N 09.0340	20	09.9810E
'0054	'T3_042	30. Okt 07	22:00:34	57	N 08.9050	20	04.4290E
'0055	'T3_041	30. Okt 07	22:50:35	57	N 08.9140	19	58.7990E
'0056	'T3_040	31. Okt 07	00:08:54	57	N 08.8910	19	53.4300E
'0057	'T3_039	31. Okt 07	01:21:08	57	N 08.9660	19	47.6190E
'0058	'T3_048	31. Okt 07	02:32:42	57	N 05.9320	19	42.0590E
'0059	'T3_047	31. Okt 07	03:21:57	57	N 05.9490	19	47.4680E
'0060	'T3_046	31. Okt 07	04:15:13	57	N 05.9930	19	53.0850E
'0061	'T3_045	31. Okt 07	05:30:16	57	N 05.9820	19	59.3380E
'0062	'T3_044	31. Okt 07	05:51:08	57	N 05.9760	20	04.1220E
'0063	'T3_051	31. Okt 07	07:17:04	57	N 03.0430	19	53.2370E
'0064	'T3_052	31. Okt 07	08:18:27	57	N 00.0660	19	47.7040E
'0065	'T3_049	31. Okt 07	09:11:59	57	N 02.9770	19	42.2100E
'0066	'T3_050	31. Okt 07	09:53:14	57	N 02.9970	19	47.7680E

SW Long-Term Station

Station	Name	Datum	Start (UTC)	Lat (deg)	Lon (deg)	End (UTC)
		31. Okt 07	10:49	57.12 N	19.88 E	18:56

4. MSS station tables

Test station TFE1					
Cast	Date	Time (UTC)	Lon (deg)	Lat (deg)	Depth (m)
B03_000 2	23-Oct-2007	11:21:59	12.3120	54.3916	13.1
B03_000 3	23-Oct-2007	11:22:57	12.3120	54.3916	13.2
B03_000 4	23-Oct-2007	11:24:32	12.3120	54.3916	13.0
B03_000 5	23-Oct-2007	11:26:00	12.3119	54.3917	13.0
B03_000 6	23-Oct-2007	11:27:22	12.3120	54.3917	13.0
B03_000 7	23-Oct-2007	11:28:51	12.3120	54.3917	13.0
B03_000 8	23-Oct-2007	11:30:24	12.3120	54.3916	13.1
B03_000 9	23-Oct-2007	11:31:38	12.3120	54.3916	13.1
B03_001 0	23-Oct-2007	11:33:41	12.3120	54.3917	13.0
B03_001 1	23-Oct-2007	11:34:47	12.3120	54.3916	13.0

MSS-CTD Calibration					
Cast	Date	Time (UTC)	Lon (deg)	Lat (deg)	Depth (m)
B03_001 2	25-Oct-2007	10:40:42	19.6949	57.0597	10.4
B03_001 3	25-Oct-2007	11:41:46	19.6950	57.0592	185.8

TT-Transect					
Cast	Date	Time (UTC)	Lon (deg)	Lat (deg)	Depth (m)
B03_001 4	25-Oct-2007	16:02:21	19.9233	57.2153	223.7
B03_001 5	25-Oct-2007	17:18:52	19.9815	57.2565	234.8
B03_001 6	25-Oct-2007	18:37:50	20.0365	57.2945	238.5
B03_001 7	25-Oct-2007	18:49:40	20.0331	57.2947	238.1
B03_001 8	25-Oct-2007	19:00:37	20.0303	57.2947	237.9
B03_001 9	25-Oct-2007	19:11:24	20.0273	57.2947	237.6
B03_002 0	25-Oct-2007	19:23:54	20.0236	57.2951	237.3
B03_002 1	25-Oct-2007	20:35:46	20.0991	57.3353	237.6
B03_002 2	25-Oct-2007	20:46:53	20.0962	57.3357	237.4
B03_002 3	25-Oct-2007	20:59:22	20.0930	57.3364	237.1
B03_002 4	25-Oct-2007	21:11:01	20.0901	57.3367	236.9

B03_002					
5	25-Oct-2007	21:22:16	20.0873	57.3367	236.9
B03_002					
6	25-Oct-2007	23:19:00	20.1583	57.3726	228.7
B03_002					
7	26-Oct-2007	00:39:14	20.2181	57.4135	219.5
B03_002					
8	26-Oct-2007	01:50:15	20.2765	57.4527	209.8
B03_002					
9	26-Oct-2007	03:02:09	20.3280	57.4907	196.9

Cast	Date	T3-Grid			Depth (m)
		Time (UTC)	Lon (deg)	Lat (deg)	
B03_003					
0	26-Oct-2007	03:54:29	20.3509	57.5008	182.0
B03_003					
1	26-Oct-2007	04:04:13	20.3500	57.5013	181.5
B03_003					
2	26-Oct-2007	04:13:39	20.3498	57.5020	181.5
B03_003					
3	26-Oct-2007	04:23:27	20.3492	57.5026	181.9
B03_003					
4	26-Oct-2007	04:32:34	20.3485	57.5033	182.0
B03_003					
5	26-Oct-2007	05:32:48	20.2556	57.5000	189.1
B03_003					
6	26-Oct-2007	05:42:23	20.2553	57.5007	188.7
B03_003					
7	26-Oct-2007	05:51:07	20.2552	57.5012	188.4
B03_003					
8	26-Oct-2007	05:59:46	20.2552	57.5019	188.0
B03_003					
9	26-Oct-2007	06:08:41	20.2548	57.5027	187.1
B03_004					
0	26-Oct-2007	07:33:06	20.0700	57.4504	191.8
B03_004					
1	26-Oct-2007	07:41:22	20.0686	57.4510	190.4
B03_004					
2	26-Oct-2007	07:50:08	20.0667	57.4513	189.1
B03_004					
3	26-Oct-2007	07:58:47	20.0650	57.4520	188.6
B03_004					
4	26-Oct-2007	08:10:50	20.0617	57.4532	185.1
B03_004					
5	26-Oct-2007	09:21:58	20.1599	57.4507	201.9
B03_004					
6	26-Oct-2007	09:30:50	20.1570	57.4516	201.0
B03_004					
7	26-Oct-2007	09:39:57	20.1545	57.4528	199.5
B03_004					
8	26-Oct-2007	09:49:27	20.1515	57.4539	198.1
B03_004					
9	26-Oct-2007	09:58:43	20.1485	57.4550	198.4
B03_005					
0	26-Oct-2007	11:16:11	20.2561	57.4537	208.2
B03_005					
1	26-Oct-2007	11:26:36	20.2542	57.4556	208.1
B03_005					
2	26-Oct-2007	11:37:27	20.2525	57.4577	207.8
B03_005					
3	26-Oct-2007	11:47:38	20.2510	57.4594	207.1

B03_005					
4	26-Oct-2007	11:57:52	20.2486	57.4611	206.4
B03_005					
5	26-Oct-2007	13:11:13	20.3510	57.4510	198.9
B03_005					
6	26-Oct-2007	13:21:04	20.3499	57.4523	197.5
B03_005					
7	26-Oct-2007	13:30:55	20.3487	57.4535	198.0
B03_005					
8	26-Oct-2007	13:40:30	20.3473	57.4549	197.8
B03_005					
9	26-Oct-2007	13:50:05	20.3459	57.4562	198.4
B03_006					
0	26-Oct-2007	14:59:15	20.4444	57.4499	188.9
B03_006					
1	26-Oct-2007	15:08:30	20.4440	57.4505	188.9
B03_006					
2	26-Oct-2007	15:18:15	20.4439	57.4513	188.7
B03_006					
3	26-Oct-2007	15:28:02	20.4433	57.4517	188.7
B03_006					
4	26-Oct-2007	15:37:48	20.4427	57.4522	188.9
B03_006					
5	26-Oct-2007	16:34:50	20.4456	57.4002	185.5
B03_006					
6	26-Oct-2007	16:43:05	20.4450	57.4009	185.9
B03_006					
7	26-Oct-2007	16:51:23	20.4444	57.4014	186.5
B03_006					
8	26-Oct-2007	17:00:04	20.4442	57.4020	186.9
B03_006					
9	26-Oct-2007	17:08:42	20.4435	57.4025	187.3
B03_007					
0	26-Oct-2007	18:11:47	20.3503	57.3992	211.5
B03_007					
1	26-Oct-2007	18:21:54	20.3496	57.4000	211.3
B03_007					
2	26-Oct-2007	18:32:31	20.3490	57.4008	211.0
B03_007					
3	26-Oct-2007	18:42:48	20.3485	57.4017	210.9
B03_007					
4	26-Oct-2007	18:53:10	20.3478	57.4026	211.2
B03_007					
5	26-Oct-2007	19:54:28	20.2578	57.3999	222.8
B03_007					
6	26-Oct-2007	20:04:59	20.2570	57.4005	222.7
B03_007					
7	26-Oct-2007	20:17:20	20.2559	57.4015	222.5
B03_007					
8	26-Oct-2007	20:27:56	20.2552	57.4023	222.3
B03_007					
9	26-Oct-2007	20:38:22	20.2543	57.4030	222.1
B03_008					
0	26-Oct-2007	21:35:41	20.1664	57.3997	220.3
B03_008					
1	26-Oct-2007	21:45:48	20.1655	57.4009	220.2
B03_008					
2	26-Oct-2007	21:57:01	20.1644	57.4023	220.0
B03_008					
3	26-Oct-2007	22:07:10	20.1633	57.4035	219.7
B03_008					
4	26-Oct-2007	22:18:28	20.1623	57.4049	219.1
B03_008					
	26-Oct-2007	23:22:55	20.0736	57.4015	215.3

5					
B03_008					
6	26-Oct-2007	23:33:12	20.0722	57.4031	214.0
B03_008					
7	26-Oct-2007	23:43:18	20.0709	57.4046	213.3
B03_008					
8	26-Oct-2007	23:55:00	20.0692	57.4063	211.5
B03_008					
9	27-Oct-2007	00:06:01	20.0680	57.4081	207.9
B03_009					
0	27-Oct-2007	01:09:58	19.9804	57.4016	204.4
B03_009					
1	27-Oct-2007	01:20:00	19.9786	57.4035	203.7
B03_009					
2	27-Oct-2007	01:29:51	19.9768	57.4054	203.3
B03_009					
3	27-Oct-2007	01:39:41	19.9748	57.4072	203.0
B03_009					
4	27-Oct-2007	01:49:38	19.9731	57.4090	202.6
B03_009					
5	27-Oct-2007	02:51:39	19.8884	57.4019	190.8
B03_009					
6	27-Oct-2007	03:00:57	19.8867	57.4037	189.2
B03_009					
7	27-Oct-2007	03:10:28	19.8849	57.4056	187.1
B03_009					
8	27-Oct-2007	03:19:03	19.8833	57.4074	185.5
B03_009					
9	27-Oct-2007	03:27:32	19.8818	57.4091	184.0
B03_010					
0	27-Oct-2007	04:44:34	19.7950	57.3492	189.3
B03_010					
1	27-Oct-2007	04:53:29	19.7929	57.3505	189.3
B03_010					
2	27-Oct-2007	05:04:26	19.7901	57.3521	188.8
B03_010					
3	27-Oct-2007	05:14:15	19.7873	57.3534	185.4
B03_010					
4	27-Oct-2007	05:22:43	19.7851	57.3546	184.5
B03_010					
5	27-Oct-2007	06:28:44	19.8893	57.3501	209.5
B03_010					
6	27-Oct-2007	06:38:53	19.8875	57.3521	209.0
B03_010					
7	27-Oct-2007	06:49:58	19.8857	57.3543	208.2
B03_010					
8	27-Oct-2007	07:00:19	19.8838	57.3563	207.2
B03_010					
9	27-Oct-2007	07:10:41	19.8818	57.3583	205.8
B03_011					
0	27-Oct-2007	08:22:01	19.9786	57.3518	221.0
B03_011					
1	27-Oct-2007	08:33:52	19.9770	57.3543	219.5
B03_011					
2	27-Oct-2007	08:44:25	19.9752	57.3562	218.6
B03_011					
3	27-Oct-2007	08:55:53	19.9734	57.3584	217.4
B03_011					
4	27-Oct-2007	09:07:15	19.9711	57.3605	216.4
B03_011					
5	27-Oct-2007	10:32:43	20.0592	57.3235	232.0
B03_011					
6	27-Oct-2007	10:43:27	20.0577	57.3258	231.1

B03_011					
7	27-Oct-2007	10:54:00	20.0562	57.3281	230.3
B03_011					
8	27-Oct-2007	11:04:26	20.0552	57.3303	228.1
B03_011					
9	27-Oct-2007	11:15:06	20.0540	57.3325	229.7
B03_012					
0	27-Oct-2007	11:39:07	20.0601	57.3222	232.4
B03_012					
1	27-Oct-2007	11:49:52	20.0587	57.3245	231.6
B03_012					
2	27-Oct-2007	12:08:41	20.0562	57.3286	230.1
B03_012					
3	27-Oct-2007	12:49:14	20.0593	57.3215	232.4
B03_012					
4	27-Oct-2007	12:59:38	20.0583	57.3233	231.7
B03_012					
5	27-Oct-2007	13:09:42	20.0572	57.3254	231.1
B03_012					
6	27-Oct-2007	13:20:04	20.0560	57.3274	230.3
B03_012					
7	27-Oct-2007	14:37:54	20.0769	57.3464	230.6
B03_012					
8	27-Oct-2007	14:49:00	20.0752	57.3483	230.3
B03_012					
9	27-Oct-2007	14:59:21	20.0733	57.3502	229.5
B03_013					
0	27-Oct-2007	15:09:46	20.0714	57.3523	228.6
B03_013					
1	27-Oct-2007	15:20:33	20.0696	57.3544	227.7
B03_013					
2	27-Oct-2007	17:23:09	20.1642	57.3507	229.9
B03_013					
3	27-Oct-2007	17:34:15	20.1611	57.3533	229.2
B03_013					
4	27-Oct-2007	17:44:54	20.1582	57.3559	228.6
B03_013					
5	27-Oct-2007	17:55:33	20.1552	57.3583	228.1
B03_013					
6	27-Oct-2007	18:06:16	20.1523	57.3608	226.7
B03_013					
7	27-Oct-2007	19:19:04	20.2576	57.3498	227.6
B03_013					
8	27-Oct-2007	19:37:08	20.2537	57.3539	227.7
B03_013					
9	27-Oct-2007	19:48:39	20.2508	57.3567	227.6
B03_014					
0	27-Oct-2007	20:00:26	20.2480	57.3596	227.5
B03_014					
1	27-Oct-2007	20:12:31	20.2454	57.3626	227.3
B03_014					
2	27-Oct-2007	21:39:17	20.3505	57.3535	207.6
B03_014					
3	27-Oct-2007	21:49:48	20.3503	57.3558	207.8
B03_014					
4	27-Oct-2007	22:00:08	20.3496	57.3578	208.1
B03_014					
5	27-Oct-2007	22:10:46	20.3489	57.3598	208.3
B03_014					
6	27-Oct-2007	22:20:39	20.3483	57.3616	208.4
B03_014					
7	27-Oct-2007	23:54:12	20.2591	57.3025	224.9
B03_014	28-Oct-2007	00:04:50	20.2586	57.3045	225.2

8					
B03_014					
9	28-Oct-2007	00:15:11	20.2584	57.3062	225.7
B03_015					
0	28-Oct-2007	00:33:03	20.2574	57.3091	226.1
B03_015					
1	28-Oct-2007	00:43:59	20.2567	57.3108	226.1
B03_015					
2	28-Oct-2007	02:07:48	20.1654	57.3034	233.6
B03_015					
3	28-Oct-2007	02:18:22	20.1645	57.3052	233.6
B03_015					
4	28-Oct-2007	02:29:05	20.1636	57.3071	233.5
B03_015					
5	28-Oct-2007	02:39:53	20.1626	57.3090	233.4
B03_015					
6	28-Oct-2007	02:51:44	20.1615	57.3108	233.4
B03_015					
7	28-Oct-2007	03:02:11	20.1605	57.3123	233.3
B03_015					
8	28-Oct-2007	04:29:18	20.0754	57.3015	234.8
B03_015					
9	28-Oct-2007	04:40:12	20.0755	57.3029	234.8
B03_016					
0	28-Oct-2007	04:50:33	20.0755	57.3043	234.9
B03_016					
1	28-Oct-2007	05:00:49	20.0754	57.3057	234.7
B03_016					
2	28-Oct-2007	05:13:00	20.0754	57.3075	234.6
B03_016					
3	28-Oct-2007	06:29:50	19.9797	57.3006	227.0
B03_016					
4	28-Oct-2007	06:40:32	19.9797	57.3028	226.6
B03_016					
5	28-Oct-2007	06:51:37	19.9800	57.3051	226.1
B03_016					
6	28-Oct-2007	07:03:06	19.9797	57.3075	225.9
B03_016					
7	28-Oct-2007	07:13:36	19.9796	57.3096	225.8
B03_016					
8	28-Oct-2007	08:10:56	19.8907	57.2997	215.7
B03_016					
9	28-Oct-2007	08:20:36	19.8907	57.3021	214.8
B03_017					
0	28-Oct-2007	08:30:04	19.8911	57.3045	214.4
B03_017					
1	28-Oct-2007	08:39:46	19.8912	57.3071	214.2
B03_017					
2	28-Oct-2007	08:49:06	19.8912	57.3095	214.2
B03_017					
3	28-Oct-2007	09:44:36	19.7972	57.2946	197.5
B03_017					
4	28-Oct-2007	09:55:03	19.7974	57.2964	196.7
B03_017					
5	28-Oct-2007	10:03:45	19.7975	57.2979	196.3
B03_017					
6	28-Oct-2007	10:12:48	19.7973	57.2994	195.7
B03_017					
7	28-Oct-2007	10:22:23	19.7972	57.3011	195.3
B03_017					
8	28-Oct-2007	11:30:10	19.8019	57.2517	203.2
B03_017					
9	28-Oct-2007	11:40:25	19.8044	57.2538	203.2

B03_018					
0	28-Oct-2007	11:50:33	19.8063	57.2557	203.1
B03_018					
1	28-Oct-2007	11:59:54	19.8086	57.2573	203.0
B03_018					
2	28-Oct-2007	12:08:53	19.8107	57.2590	203.1
B03_018					
3	28-Oct-2007	13:17:00	19.8970	57.2555	215.8
B03_018					
4	28-Oct-2007	13:26:31	19.8993	57.2580	215.2
B03_018					
5	28-Oct-2007	13:36:25	19.9017	57.2607	217.7
B03_018					
6	28-Oct-2007	13:46:16	19.9041	57.2634	218.2
B03_018					
7	28-Oct-2007	13:56:23	19.9069	57.2662	218.6
B03_018					
8	28-Oct-2007	15:06:57	19.9810	57.2499	228.9
B03_018					
9	28-Oct-2007	15:18:07	19.9837	57.2521	229.1
B03_019					
0	28-Oct-2007	15:28:22	19.9858	57.2544	230.0
B03_019					
1	28-Oct-2007	15:39:37	19.9887	57.2569	230.5
B03_019					
2	28-Oct-2007	15:50:27	19.9915	57.2593	230.8
B03_019					
3	28-Oct-2007	16:57:33	20.0735	57.2489	233.9
B03_019					
4	28-Oct-2007	17:08:21	20.0751	57.2512	234.1
B03_019					
5	28-Oct-2007	17:19:06	20.0767	57.2536	234.3
B03_019					
6	28-Oct-2007	17:29:29	20.0790	57.2558	234.4
B03_019					
7	28-Oct-2007	17:39:54	20.0810	57.2580	234.5
B03_019					
8	28-Oct-2007	18:40:59	20.1683	57.2524	231.7
B03_019					
9	28-Oct-2007	18:53:01	20.1708	57.2548	227.2
B03_020					
0	28-Oct-2007	19:03:49	20.1730	57.2572	231.7

	SW Long-Term Station				
Cast	Date	Time (UTC)	Lon (deg)	Lat (deg)	Depth (m)
B03_020					
1	31-Oct-2007	11:10:45	19.8709	57.1208	219.0
B03_020					
2	31-Oct-2007	11:20:28	19.8737	57.1214	219.1
B03_020					
3	31-Oct-2007	11:29:49	19.8764	57.1217	219.2
B03_020					
4	31-Oct-2007	11:39:39	19.8791	57.1222	219.1
B03_020					
5	31-Oct-2007	11:49:30	19.8818	57.1226	219.0
B03_020					
6	31-Oct-2007	11:59:28	19.8844	57.1234	219.0
B03_020					
7	31-Oct-2007	12:09:15	19.8871	57.1241	218.9
B03_020					
8	31-Oct-2007	12:19:20	19.8900	57.1247	218.8
B03_020					
9	31-Oct-2007	12:44:04	19.8638	57.1205	219.2

B03_021 0	31-Oct-2007	12:53:45	19.8670	57.1208	219.1
B03_021 1	31-Oct-2007	13:04:14	19.8706	57.1214	219.0
B03_021 2	31-Oct-2007	13:14:56	19.8742	57.1218	219.0
B03_021 3	31-Oct-2007	13:25:42	19.8776	57.1223	219.0
B03_021 4	31-Oct-2007	13:35:23	19.8806	57.1230	218.9
B03_021 5	31-Oct-2007	13:45:07	19.8837	57.1235	218.9
B03_021 6	31-Oct-2007	13:55:09	19.8870	57.1241	218.7
B03_021 7	31-Oct-2007	14:21:36	19.8646	57.1205	219.0
B03_021 8	31-Oct-2007	14:31:07	19.8675	57.1212	218.9
B03_021 9	31-Oct-2007	14:41:39	19.8708	57.1218	218.9
B03_022 0	31-Oct-2007	14:51:23	19.8738	57.1224	219.1
B03_022 1	31-Oct-2007	15:00:55	19.8770	57.1230	219.1
B03_022 2	31-Oct-2007	15:10:48	19.8802	57.1238	219.1
B03_022 3	31-Oct-2007	15:20:22	19.8834	57.1244	219.0
B03_022 4	31-Oct-2007	15:30:07	19.8866	57.1251	218.9
B03_022 5	31-Oct-2007	16:00:56	19.8656	57.1204	218.7
B03_022 6	31-Oct-2007	16:10:26	19.8686	57.1212	218.6
B03_022 7	31-Oct-2007	16:20:05	19.8719	57.1220	218.8
B03_022 8	31-Oct-2007	16:29:21	19.8749	57.1228	218.9
B03_022 9	31-Oct-2007	16:38:41	19.8780	57.1236	219.0
B03_023 0	31-Oct-2007	16:48:13	19.8813	57.1242	218.9
B03_023 1	31-Oct-2007	16:58:58	19.8851	57.1252	218.9
B03_023 2	31-Oct-2007	17:10:03	19.8892	57.1260	218.7
B03_023 3	31-Oct-2007	17:47:04	19.8649	57.1204	218.5
B03_023 4	31-Oct-2007	17:58:23	19.8691	57.1215	218.5
B03_023 5	31-Oct-2007	18:08:38	19.8728	57.1225	218.7
B03_023 6	31-Oct-2007	18:18:57	19.8767	57.1238	218.9

BaTRE 3

SF₆ Daten Peak-Area vs. Sigma

