

Baltic Sea Research Institute Warnemünde

Cruise report

No. 11/03/04

r/v „Gauss“

Monitoring cruise

13 October - 25 October 2003

Kiel Bight to northern Gotland sea

This report is based on preliminary data.

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Monitoring cruise
CruiseNo. 11/03/04
r/v „Gauss“

Warnemünde
27 October 2003

The fifth and last monitoring cruise in 2003 performed by the Baltic Sea research Institute Warnemünde in the frame of the HELCOM COMBINE programme was carried out with r/v „Gauss“ between October 13th and October 25th 2003.

Scientific staff participating:

Günther Nausch (scientist in charge)	13.10. – 25.10.2003
Ulrich Breitenbach	13.10. – 25.10.2003
Suzie Christoff	13.10. – 25.10.2003
Jan Donath	13.10. – 25.10.2003
Uwe Hehl	13.10. – 25.10.2003
Günter Plüschke	13.10. – 25.10.2003
Astrid Schultz	13.10. – 25.10.2003
Sahed Tabrez	17.10. – 25.10.2003
Sylvia Walter	13.10. – 25.10.2003
Stefan Weinreben	13.10. – 25.10.2003
Anna-Maria Welz	13.10. – 25.10.2003
Michael Zettler	13.10. – 17.10.2003

The area under investigation covered the Baltic Sea between Kiel Bight and the northern Gotland Sea. Marine meteorological, hydrographic, hydrochemical and hydrobiological investigations were performed according to the COMBINE programme of HELCOM. The station map is attached to this report.

Additionally to the standard programme two moorings were recovered and laid out again in the eastern Gotland Basin.

During the first part of the cruise, weather conditions were influenced by a stable high pressure cell all over middle Europe causing air pressure of 1035 hPa. Consequently wind speed was low, normally only 3 to 4 Bft from northern directions. Sunshine prevailed and air temperature was still around 9 – 10 °C. In the middle of the cruise, a low passed the area and air pressure decreased slowly to 1010 hPa on October 20th and wind speed increased up to 7 Bft on October 22nd. Afterwards air pressure increased again up to 1022hPa. Air temperature decreased near to zero and heavy snow showers were registered on October 22nd and 23rd. Until the end of the cruise wind remained moderate and was blowing from northern directions.

The following hydrographic and hydrochemical characteristics have been observed during the cruise (cf. Tables 1 and 2 and Figs. 3 and 4):

- Surface temperatures varied between 8.29°C (Karlsö Deep) and 12.92°C (Mecklenburg Bight). Due to the long lasting and warm summer these temperatures were well above the long-term mean for the period 1971-1990 (in brackets).

Arkona Basin	12.37°C (9.74°C)
Bornholm Deep	11.98°C (9.89°C)
Gotland Deep	11.66°C (8.79°C)
Farö Deep	9.65°C (8.49°C)
Landsort Deep	9.07°C (7.88°C)
Karlsö Deep	8.29°C (8.04°C)
- The nutrient situation in the surface layer indicated the onset of the autumnal decomposition process. It is remarkable that already a certain phosphate pool exists whereas in most of the stations only low nitrate values could be measured.
- Beside the regular monitoring tasks the cruise again was focused on the effects of the saltwater inflow from January 2003. For that purpose additional stations were sampled in the eastern Gotland Basin.
- Compared to the investigations in May and July, the water renewing has continued in the eastern Gotland Basin. Now all observed stations were free of hydrogen sulphide. An intermediate oxygen minimum zone can be found at all station between 100m and 110m water depth. At the central station 271 (BMP J1) a new small inflow could be detected in a 5m thick bottom layer characterized by an increase in temperature (+0.24°C), salinity (+0.11psu) and oxygen (+0.20ml/l) compared to the layer above. Only in the Farö Deep area, behind the sill, anoxic conditions prevailed below 125m water depth. However, first signs of a renewing can be seen near to the bottom were only 0.13 mg/l hydrogen sulphide remained whereas at 125m 1.24 mg/l could be measured. It has to be doubted that the inflow was strong enough to replace all anoxic waters in that area.
- The whole western Gotland Basin is unaffected up to now by the inflow. At all sampled stations anoxic conditions were found from 100m water depth downwards.
- The development described above can be seen well by changes in temperature because the January inflow was a very cold.

	February 2003	March 2003	May 2003	July 2003	October 2003	Mean 1971-90
Bornholm Deep	3.09°C	3.69°C	3.43°C	3.71°C	3.83°C	6.12°C
Gotland Deep	6.36°C	6.69°C	4.69°C	4.63°C	4.92°C	5.62°C
Farö Deep	6.20°C	6.37°C	6.35°C	6.00°C	5.53°C	5.20°C
Landsort Deep	5.44°C	5.41°C	5.40°C	5.88°C	6.00°C	4.76°C
Karlsö Deep	5.02°C	4.96°C	4.80°C	4.90°C	4.92°C	4.18°C

- The nutrient situation in the bottom near layer reflects the water renewing as well. Stations in the eastern Gotland Basin, except the Farö Deep area, are characterized by relatively low phosphate concentrations, low ammonium values and quite high nitrate concentrations. The anoxic stations in the western Gotland Basin show elevated phosphate and ammonium concentrations and consequently no nitrate.

Table 1: Surface water layer (about 1 m depth)

Area Date	Stat. Name/No.**	Temp. °C	Sal. psu	PO ₄ ³⁻	NO ₂₃ ^{-*} µmol/l	SiO ₄
Kiel Bight 14.10.2003	360/0002	12.85	17.97	0.28	0.10	7.2
Meckl.Bight 14.10.2003	012/0006	12.92	16.35	0.24	0.04	9.1
Lübeck Bight 14.10.2003	023/0013	12.60	16.51	0.38	0.06	12.2
Arkona Basin 15.10.2003	113/0026	12.37	8.47	0.12	0.07	9.0
Pom. Bight 17.10.2003	162/0048	11.51	7.26	0.80	0.04	23.1
Bornholm Deep 16.10.2003	213/0041	11.98	7.27	0.14	0.00	9.5
Stolpe Channel 19.10.2003	222/0066	12.03	7.15	0.13	0.04	8.6
SE Gotland Basin 19.10.2003	259/0068	11.18	7.00	0.13	0.00	9.7
Gotland Deep 20.10.2003	271/0075	11.66	7.03	0.10	0.28	9.7
Farö Deep 22.10.2003	286/092	9.65	6.63	0.10	0.00	9.6
Landsort Deep 23.10.2003	284/0098	9.07	6.49	0.17	0.00	10.4
Karlsö Deep 23.10.2003	245/0101	8.29	6.94	0.24	0.04	11.3

* $\sum \text{NO}_2^- + \text{NO}_3^-$

** see attached map

Table 1: Near bottom layer

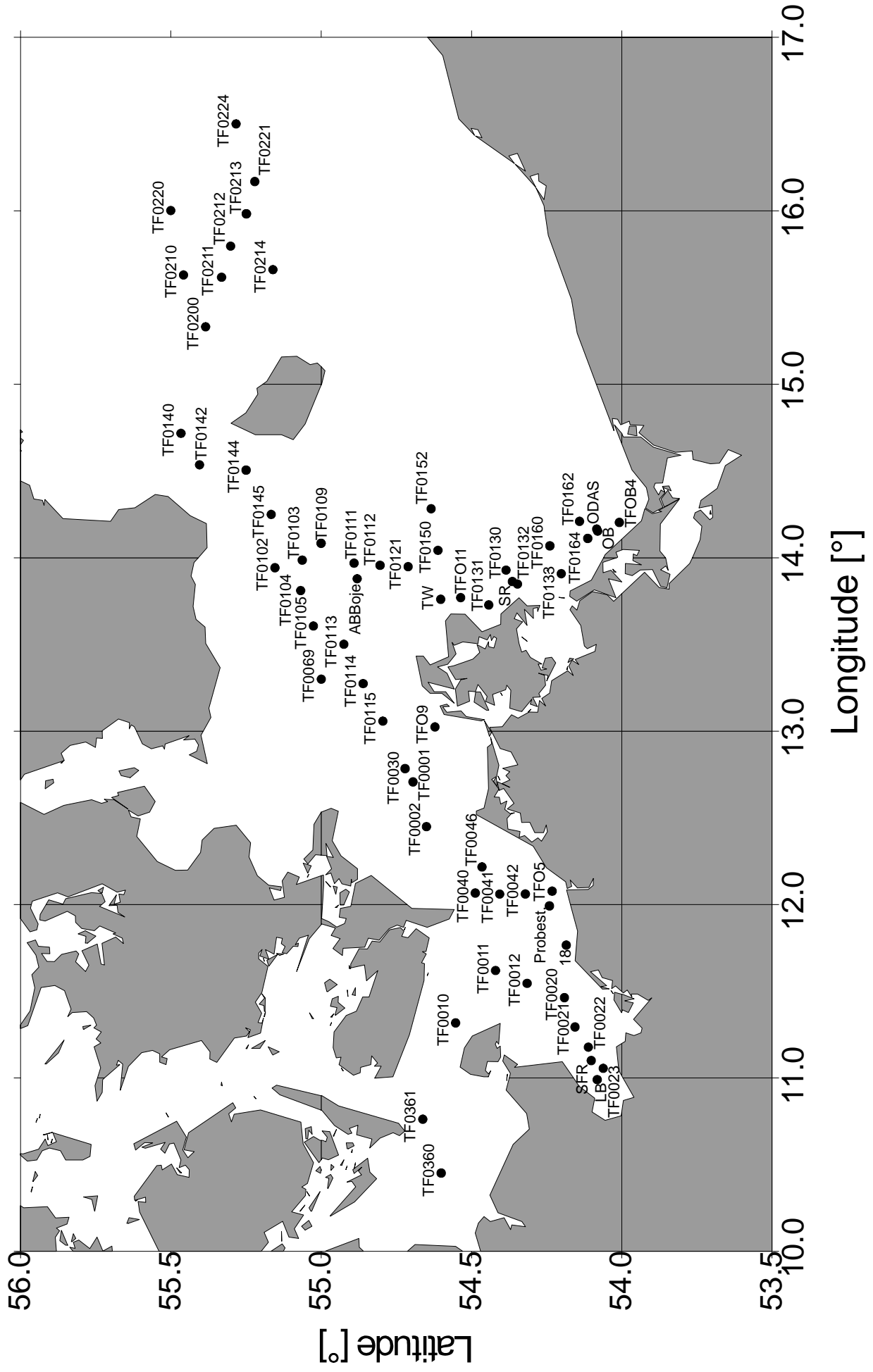
Area Date	Stat. Name/No.**	Depth m	Temp. °C	Sal. psu	O ₂ ml/l	PO ₄ ³⁻	NO ₂₃ ^{-*} µmol/l	SiO ₄
Kiel Bight 14.10.2003	360/0002	17	13.12	22.50	5.08	0.62	1.64	12.5
Meckl.Bight 14.10.2003	012/0006	23	13.12	19.03	6.03	0.37	0.69	9.8
Lübeck Bight 14.10.2003	023/0013	22	14.59	20.12	2.72	1.70	1.10	47.3
Arkona Basin 15.10.2003	113/0026	44	12.57	20.62	5.42	0.54	1.90	11.2
Pom. Bight 17.10.2003	162/0048	13	12.23	7.90	7.05	0.47	0.64	18.0
Bornholm Deep 16.10.2003	213/0041	87	3.83	18.22	1.46	0.92	0.08	39.8
Stolpe Channel 19.10.2003	222/0066	89	7.78	14.59	3.41	0.97	6.68	25.3
SE Gotland Basin 19.10.2003	259/0068	87	5.90	11.36	1.10	2.37	7.60	39.1
Gotland Deep 20.10.2003	271/0075	233	4.92	12.78	1.77	2.20	11.56	40.2
Farö Deep 22.10.2003	286/0092	188	5.53	11.84	-0.17	3.15	0.00	49.1
Landsort Deep 23.10.2003	284/0098	438	6.00	10.65	-1.34	4.02	0.00	52.0
Karlsö Deep 23.10.2003	245/0101	106	4.92	9.57	-1.39	4.45	0.00	60.5

* $\sum \text{NO}_2^- + \text{NO}_3^-$

** see attached map

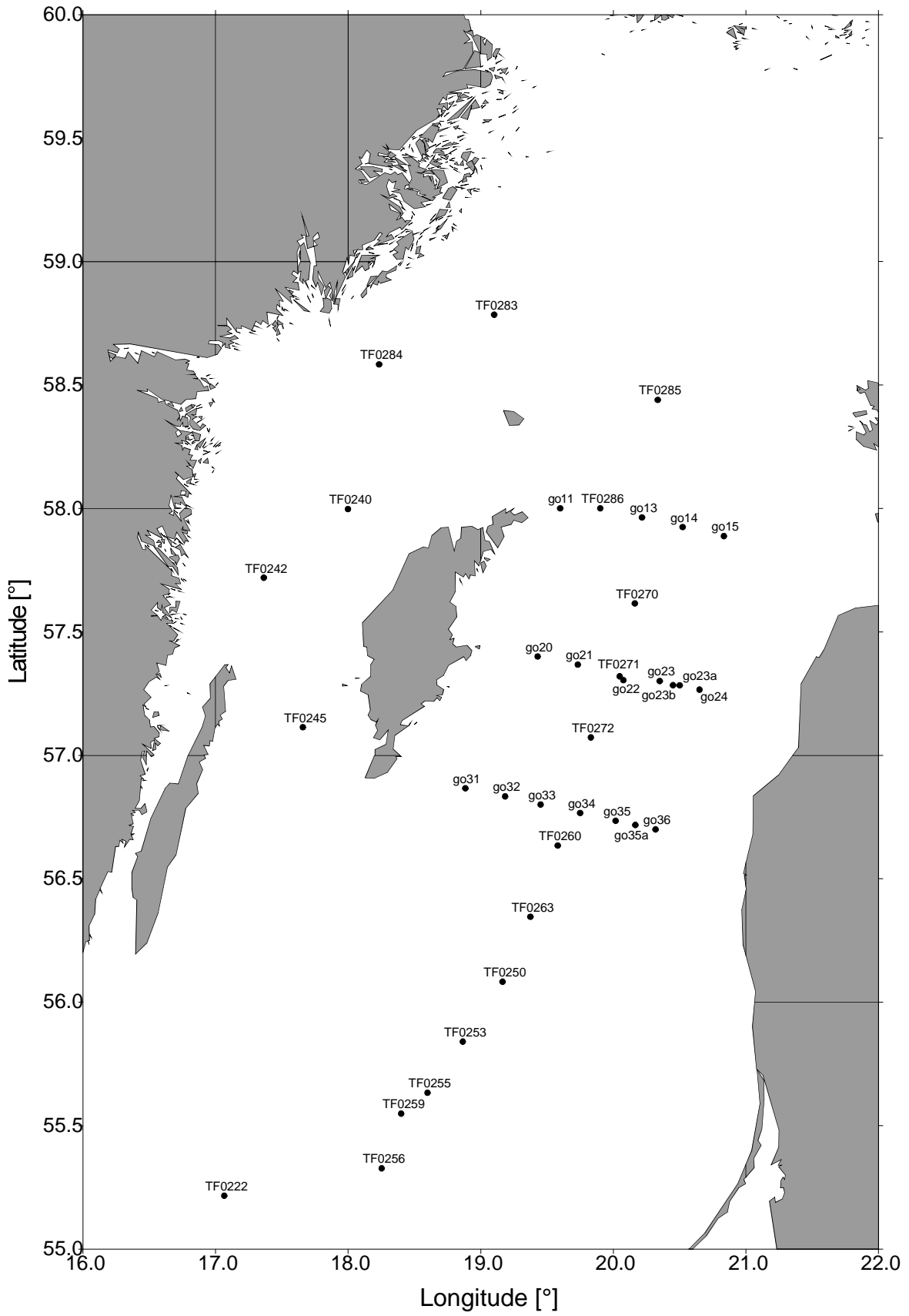
Monitoring

Station map TF110304
13.10.2003 - 25.10.2003
76 Stationen (Part 1)



Monitoring

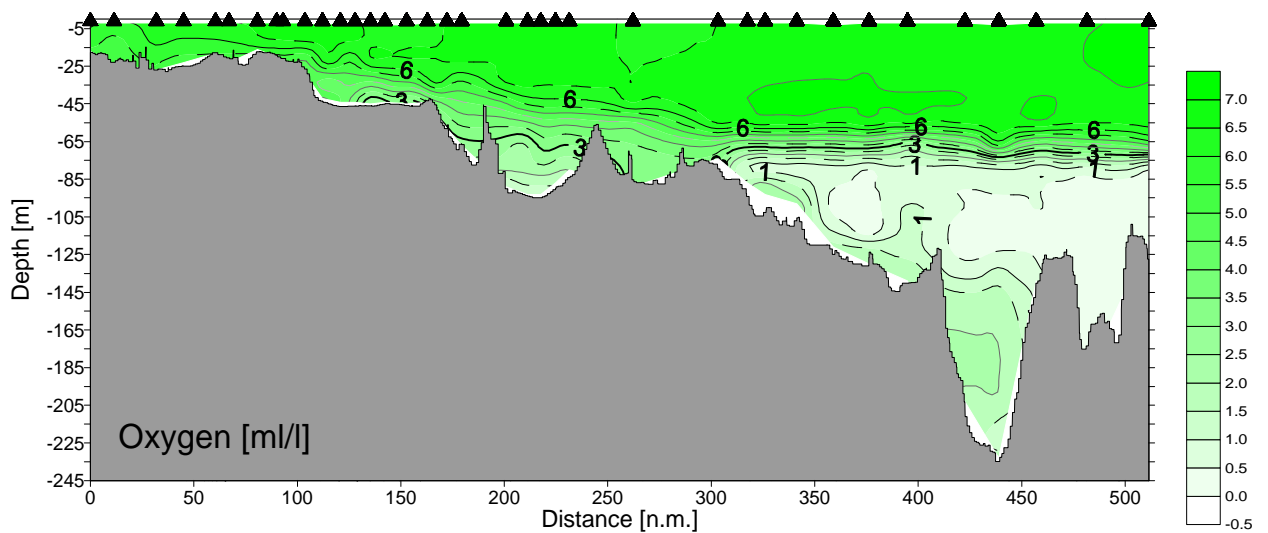
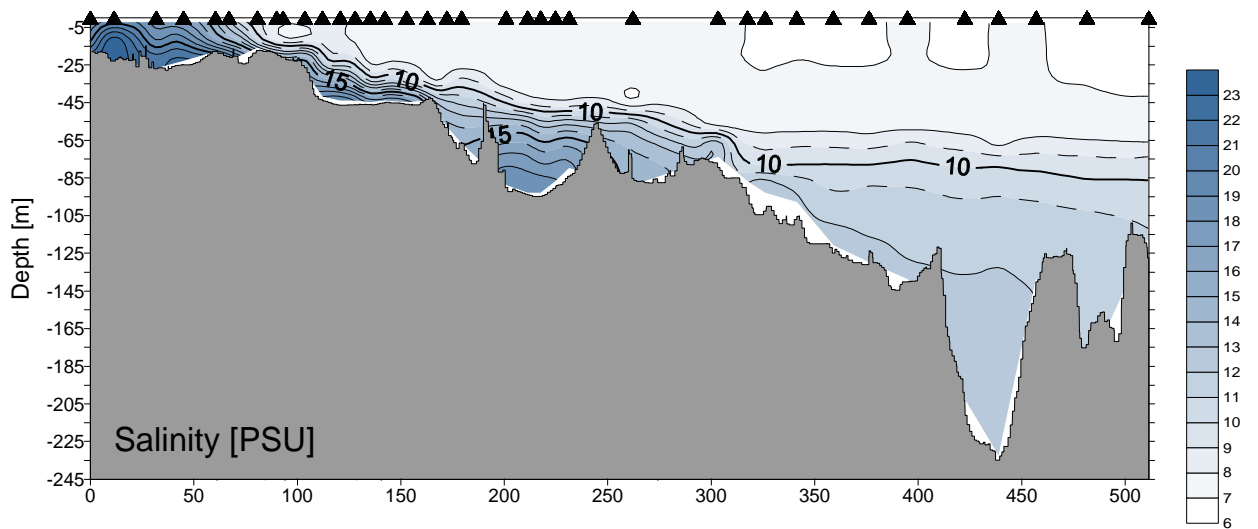
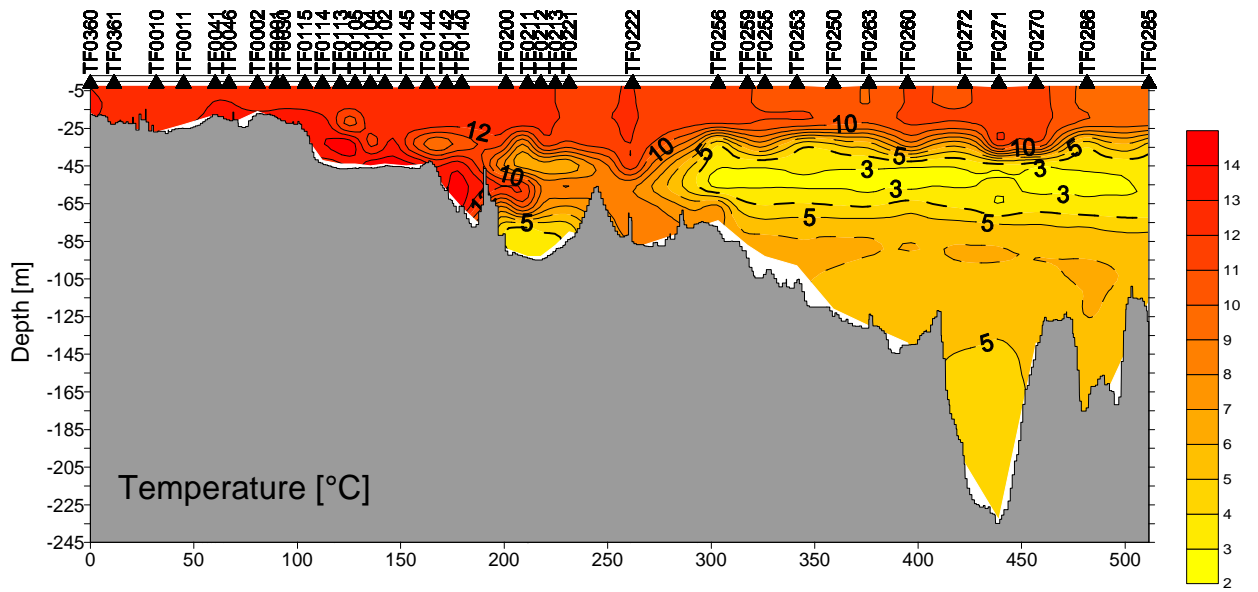
Station map TF110304
13.10.2003 - 25.10.2003
36 Stationen (Part 2)



Gesamte Ostsee

TF110304

14.10.2003 00:08 - 22.10.2003 23:38 UTC



Monitoring

TF110304

13.10.2003 - 25.10.2003

Oxygen bottom concentration [ml/l]

