

Baltic Sea Research Institute Warnemünde

r/v „Gauss“

Monitoring cruise

Cruise- No. 11 / 05 / 05 (Gauss 439)

10th May – 20th May 2005

Kiel Bight to northern Gotland sea

this report is based on preliminary data

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Monitoring cruise
CruiseNo. 11/05/05 (Gauss 439)
r/v „Gauss“

Warnemünde
21st May 2005

The third monitoring cruise in 2005 performed by the Baltic Sea Research Institute Warnemünde in the frame of the HELCOM COMBINE program was carried out with r/v „Gauss“ between May 10th and May 20th 2005.

Scientific staff participating:

Günther Nausch (scientist in charge)	10.05. – 20.05.2005
Jan Donath	10.05. – 20.05.2005
Ines Hand	10.05. – 20.05.2005
Monika Nausch	10.05. – 20.05.2005
Günter Plüschke	10.05. – 20.05.2005
Birgit Sadkowiak	10.05. – 20.05.2005
Doris Setzkorn	10.05. – 20.05.2005
Heike Simon	10.05. – 20.05.2005
Klaus-Peter Wlost	10.05. – 20.05.2005

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.

During the first part of the cruise the weather was influenced by a high pressure cell lying over the Ireland and Great Britain moving slowly eastwards. Air pressure increased from 1012 hPa on May 10th to 1024 hPa on May 15th. Wind speed was low (3 – 4 Bft), wind came from westerly directions. From May 16th to May 17th a frontal system passed with shortly increasing wind speed up to 15 m/s. Afterwards a ridge of a high pressure cell over the Azores affected the weather with again only moderate wind and occasionally calm situations. Air temperature was around 9 – 10°C.

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 9.51 °C (Lübeck Bight) and 6.79 °C (Gotland and Farö Deeps) and are well above the long-term mean for the period 1971-1990 (in brackets). The reason can be seen partly in the relatively late time of the cruise compared to earlier years. However, mostly these high temperatures were caused by the calm and sunny weather which allowed the development of a first stable thermocline in the surface layer. For example, temperature ranged at the central station in the eastern Gotland Basin between 6.79°C (2m) and 5.82°C (20m) dropping down to 3.31°C in 30m depth.

Lübeck Bight	9.51°C (8.93°C)
Arkona Basin	7.99°C (7.44°C)
Bornholm Deep	7.93°C (6.75°C)
Gotland Deep	6.79°C (5.66°C)
Farö Deep	6.79°C (5.63°C)
Landsort Deep	7.92°C (6.09°C)
Karlsö Deep	7.21°C (6.76°C)

- The nutrient situation in the surface layer reflects the development in spring. In the whole area under investigations, the nitrate reservoir is completely exhausted. Due to the low N/P ratio in winter, a certain amount of phosphate remains after the spring bloom. The phosphate concentrations range normally between 0.1 and 0.2 $\mu\text{mol/l}$. Remarkable deviations can be seen in the Bornholm Basin. Here, much higher phosphate values up to 0.61 $\mu\text{mol/l}$ were measured. The reasons for that situation are no clear up to now.
- The major Baltic inflow from January 2003 was the last strong inflow event into the Baltic Sea. The deep basins were additionally influenced by a warm summer inflow in 2003. Especially in the western Gotland Basin effects of these events still can be seen, however, in an alleviated way.
 In the Landsort Deep temperature (from 5.71°C to 5.81°C) and salinity (from 10.98 psu to 11.13 psu) increased further compared to the last cruise in March. The same hold for the Karlsö Deep where temperature increased from 5.12°C to 5.27°C and salinity rose from 9.95 psu to 10.24 psu. With the exception of the very near-bottom layer the Karlsö Deep was free of hydrogen sulphide. In the Landsort Deep an anoxic layer is still persisting between 100 and 150 m with maximum hydrogen sulphide concentrations of -0.90 ml/l. From 150 m water depth down to the bottom oxygen concentration between 0.05 and 0.19 ml/l were measured.
 In the eastern Gotland Basin, the development of a new stagnation period has already started. At the central station 271 (BMP J1) an anoxic zone has reestablished already in autumn 2004 between 220 m and the bottom. In the near-bottom layer now -1.82 ml/l hydrogen sulphide were found.
- The nutrient situation in the bottom near layer reflects the interplay between oxic and anoxic zones. Stations in the oxygenated areas, are characterized by relatively low phosphate concentrations, low ammonium values and quite high nitrate concentrations. The anoxic areas show elevated phosphate and ammonium concentrations and consequently no nitrate.

Attachments

Tables 1 and 2: Preliminary results of selected parameters in the surface layer and the near bottom layer (unvalidated results)

Figs. 1-2: Track charts

Fig. 3: Transect from the Kiel Bight to the northern Gotland Basin for temperature, salinity and oxygen (unvalidated data)

Fig. 4: Oxygen/hydrogen sulphide in the bottom near layer for selected stations

Günther Nausch

Scientist in charge

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 10.05.2005	360/0004	8.54	14.60	0.07	0.09	3.0
Meckl.Bight 10.05.2005	012/0002	9.06	10.19	0.11	0	5.2
Lübeck Bight 10.05.2005	022/0003	9.51	10.65	0.07	0.01	3.7
Arkona Basin 12.05.2005	113/0025	7.99	7.94	0.18	0.08	5.7
Pom. Bight 18.05.2004	162/0077	9.70	7.65	0.02	0.49	5.2
Bornholm Deep 13.05.2005	213/0034	7.93	7.61	0.61	0.02	14.5
Stolpe Channel 13.05.2005	222/0039	8.76	7.52	0.48	0.01	14.4
SE Gotland Basin 14.05.2005	259/0041	8.16	7.37	0.13	0.02	12.4
Gotland Deep 15.05.2005	271/0052	6.79	7.27	0.16	0	10.2
Farö Deep 16.05.2005	286/0054	6.79	6.72	0.12	0.03	8.2
Landsort Deep 16.05.2005	284/0056	7.92	6.62	0.17	0.02	11.2
Karlsö Deep 17.05.2005	245/0059	7.21	7.22	0.36	0.02	13.2

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

** see attached map

Table 2: 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 10.05.2005	360/0004	17	7.64	22.76	6.44	0.36	1.68	7.8
Meckl.Bight 10.05.2005	012/0002	23	5.69	27.04	4.69	0.87	5.87	18.1
Lübeck Bight 10.05.2005	022/0003	21	5.02	23.33	7.47	0.82	4.12	19.6
Arkona Basin 10.05.2005	113/0025	46	8.09	18.26	7.08	0.45	0.19	6.2
Pom. Bight 18.05.2004	162/0077	13	9.60	7.66	7.54	0.02	0.54	6.2
Bornholm Deep 13.05.2005	213/0034	87	7.10	16.18	-0.47	7.10	(2.51)	67.7
Stolpe Channel 13.05.2005	222/0039	87	6.42	13.30	1.74	2.02	8.86	47.9
SE Gotland Basin 14.05.2005	259/0041	86	5.62	11.17	0.98	2.86	6.78	46.6
Gotland Deep 15.05.2005	271/0052	232	5.97	12.74	-1.85	4.95	0	64.4
Farö Deep 16.05.2005	286/0054	188	6.02	12.31	-0.56	4.15	0	56.8
Landsort Deep 16.05.2005	284/0056	435	5.81	11.13	0.09	2.95	5.23	50.6
Karlsö Deep 17.05.2005	245/0059	105	5.27	10.24	n.d.	3.95	0	60.7

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

** see attached map

Monitoring

Station map TF-110505
10.05.2005 - 20.05.2005
52 Station (Part1)

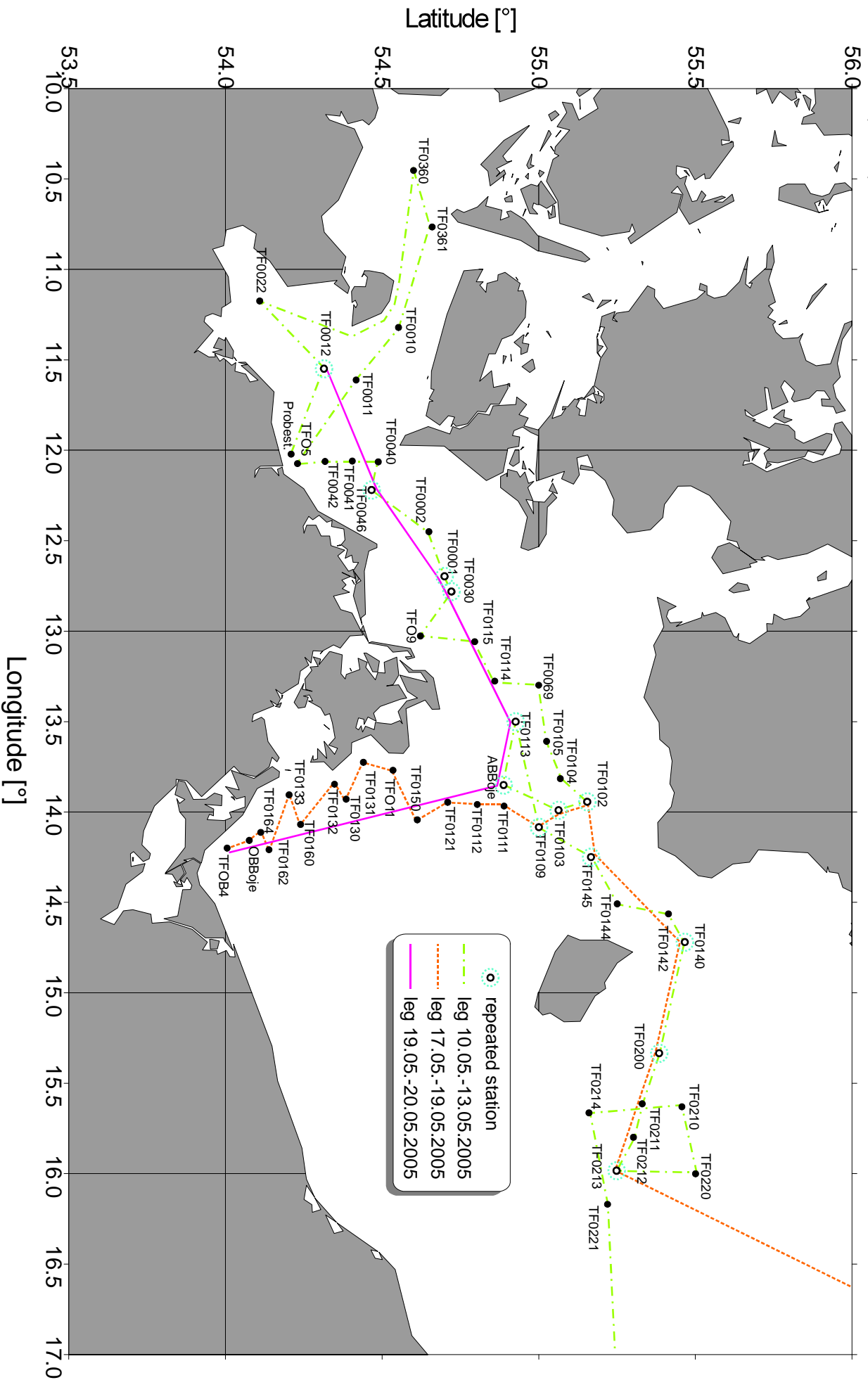
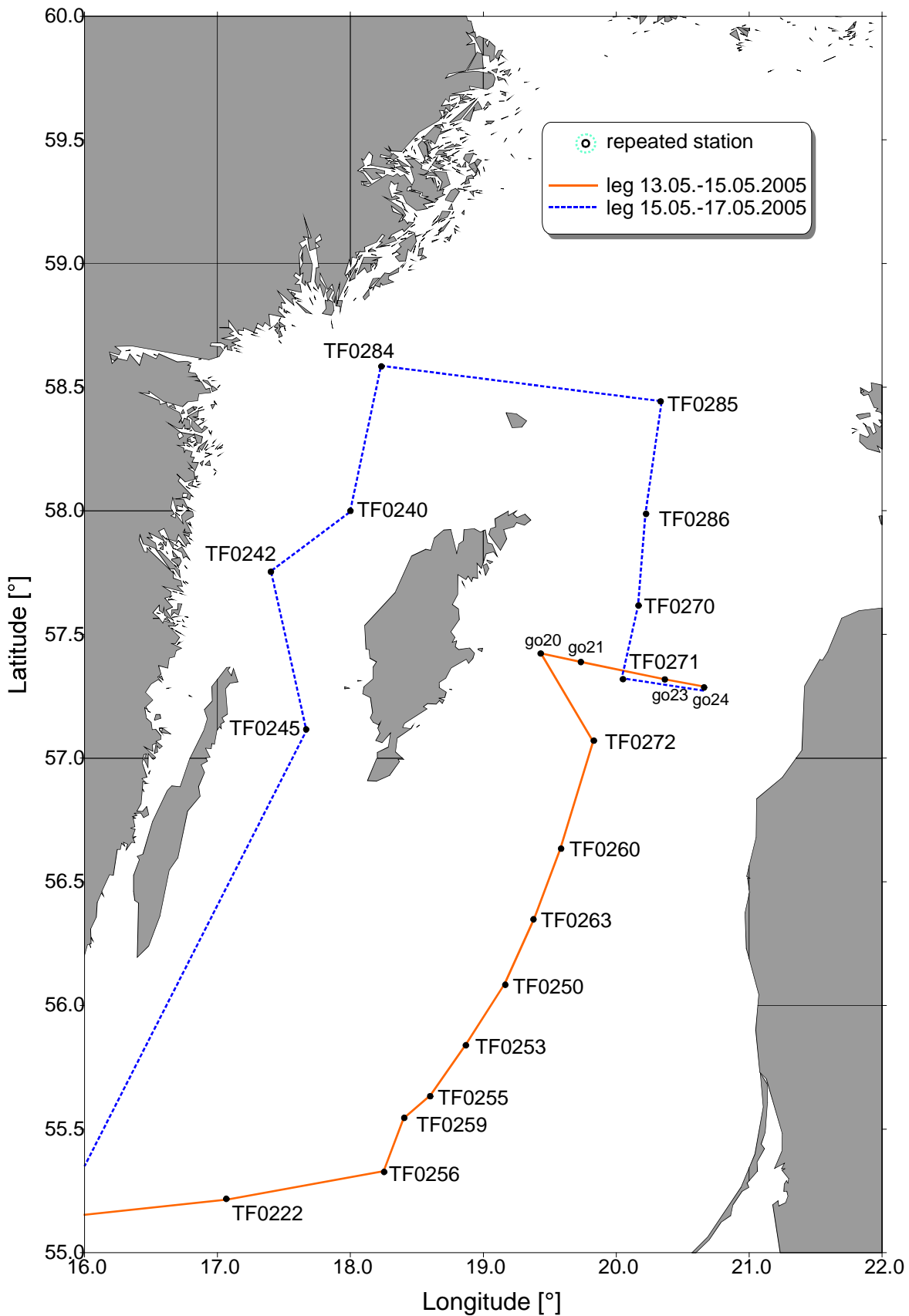


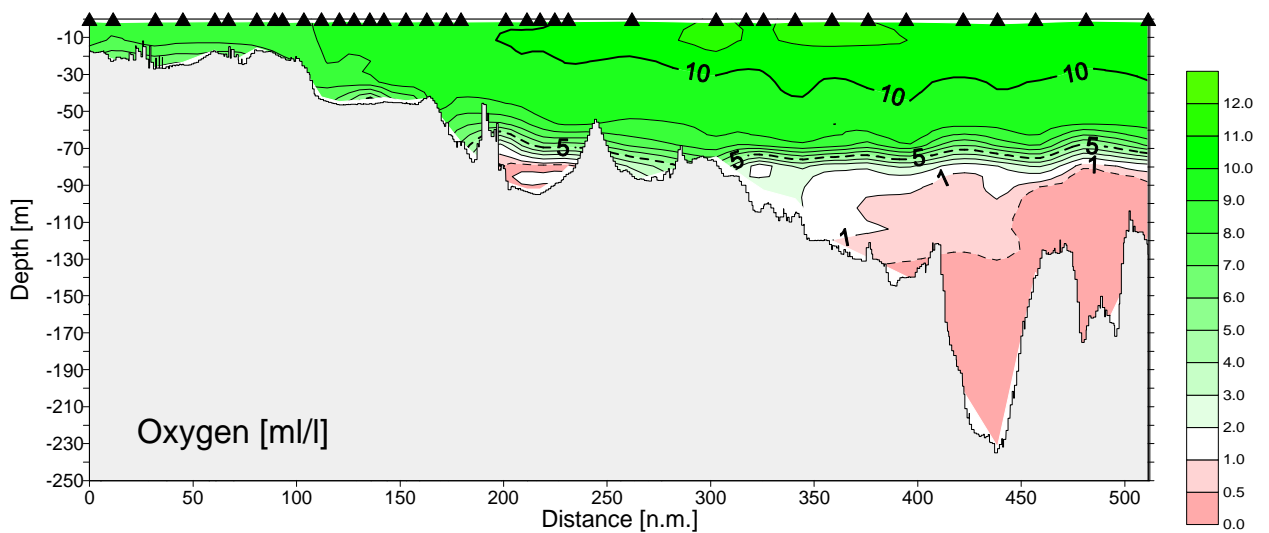
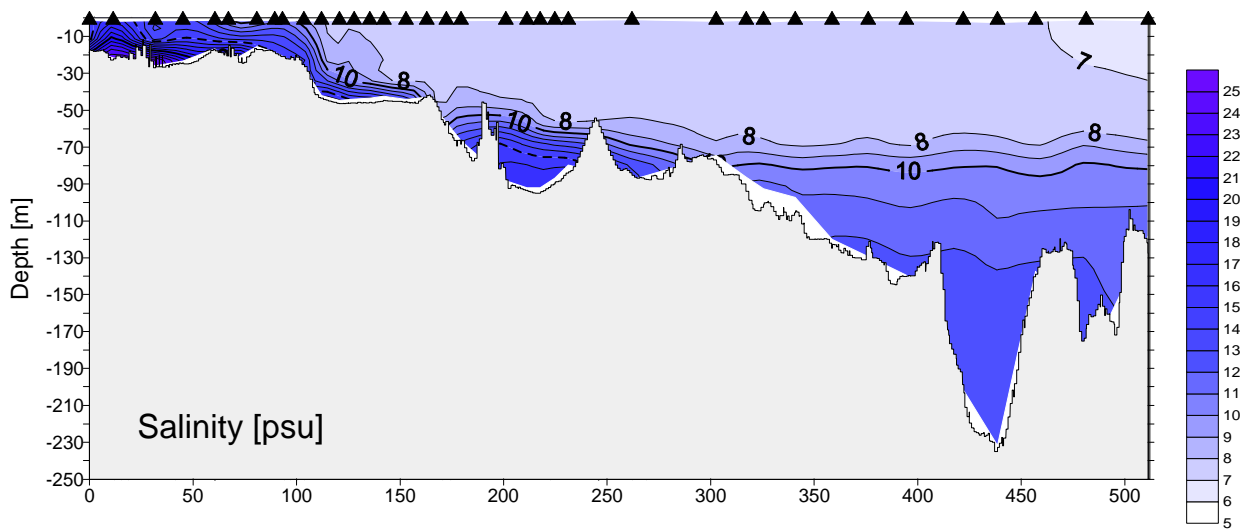
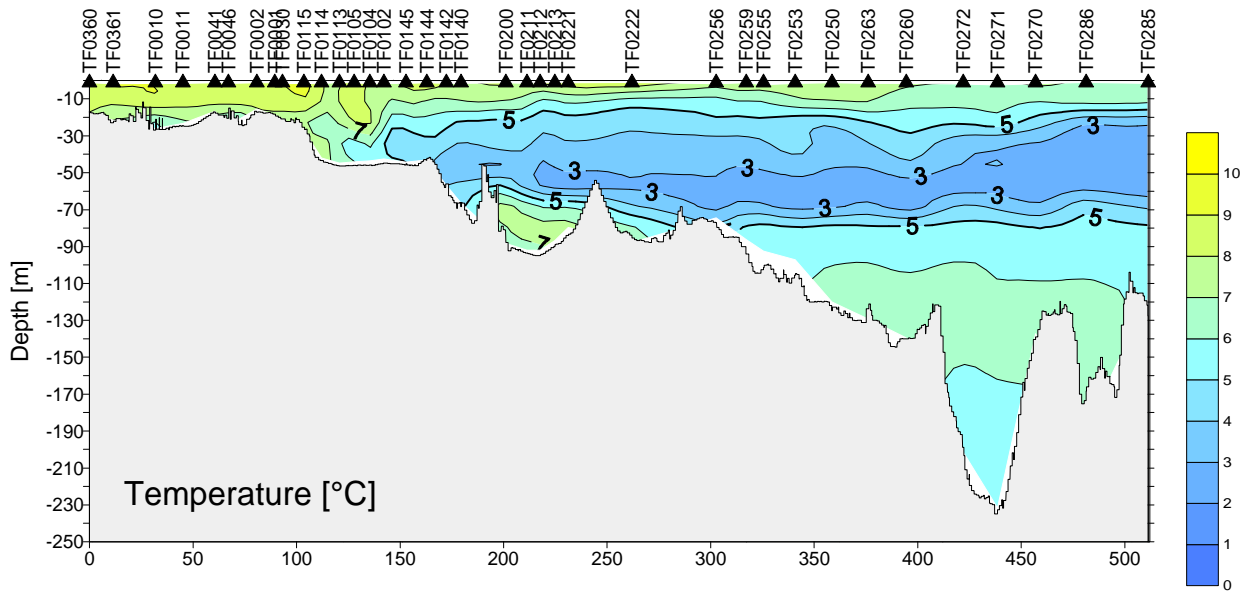
Figure 1



Kiel Bight - Gotland Sea

TF110505

10.05.2005 21:38 - 16.05.2005 06:51 UTC



Monitoring

TF110503

01.04.2005 - 11.04.2005

Oxygen bottom concentration [ml/l]

