INSTITUT FÜR OSTSEEFORSCHUNG WARNEMÜNDE
an der Universität Rostock BALTIC SEA RESEARCH INSTITUTE

Baltic Sea Research Institute Warnemünde

Cruise Report

R/V "GAUSS"

Cruise- No. 11 / 03 / 01 (Gauss 396)

08 February - 20 February 2003

This report is based on preliminary data

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1. **Cruise No.:** 11 / 03 / 01 (GAUSS 378)

2. **Dates of the cruise:** from 08/02/2003 to 20/02/2003

3. **Particulars of the research vessel:**
   Name: r/v 'GAUSS'
   Nationality: Germany
   Operating Authority: Bundesamt für Seeschiffahrt und Hydrographie (BSH), Hamburg

4. **Geographical area in which ship has operated:**
   Baltic Sea between Kiel Bight and northern Gotland Sea

5. **Dates and names of ports of call**

6. **Purpose of the cruise**
   Monitoring cruise in the frame of the HELCOM COMBINE programme

7. **Crew:**
   Name of master: B. Ahrens
   Number of crew: 21

8. **Research staff:**
   Chief scientist: Klaus Nagel

   Participants :

Doreen Betke	Phillip Köster
Kerstin Bohn	Johann Ruickoldt
Jan Donath	Astrid Schultz
Ursula Hennings	Anna-Maria Welz

9. **Co-operating institutions:**
   All institutions dealing with HELCOM BMP

10. **Scientific equipment :** CTD , water samplers, plankton net

11. General remarks and preliminary result

The area under investigation covered the Baltic Sea between Kiel Bight and the northern Gotland Basin as shown in the attached maps. Marine meteorological, hydrographic, chemical and biological investigations were performed at 70 stations according to both, the Baltic Monitoring Programme (BMP) and the Coastal Monitoring Programme (CMP) of HELCOM. The measurements were supplemented by continuos registration of standard meteorological parameters as well as surface water temperature and salinity.

For some selected stations, which are characteristic for different regions of the Baltic Sea, preliminary data of hydrographic and hydrochemical parameters in the surface and the near-bottom layer are compiled in the attached tables. These results are also compared with mean values calculated from the measurements performed during the February cruises of the years 1971 to 1990.

The weather during the cruise was dominated by a high pressure system extending from the northern Atlantic to central Europe which remained stable for the whole time of the cruise. Except the last day, air pressure varied between 1030 hPa and 1044 hPa. Wind speed was unusually low for this time of the season and varied between 4 m/s and 10 m/s for almost all the time. Highest wind speed was observed on 14/02/2003 when up to 12 m/s were measured. Air temperatures varied around 0°C with a maximum of 2.4°C and a minimum of –4.1°C.

Temperatures measured in the near surface water layer of the entire Baltic Sea were significantly lower than those observed during the monitoring cruise in February 2002 and - especially in the eastern and central parts – lower than the long term mean values for this time of the year. In the Pomeranian Bight some drifting ice fields were observed. Oxygen concentrations found in the surface layer are rather high due to higher solubility of Oxygen at lower temperatures. Except a few stations in the western Baltic Sea, which were strongly influenced by water from the Kattegatt, no striking differences from long term means were found for salinity in the surface layer. Also concentrations of nitrate and phosphate were in the range expected from long term observations and only minor differences were found with respect to the concentrations in February last year. Only at Station TFOB4, which is located closely to the mouth of the river Oder, high concentrations of nitrate were found due to riverine inputs.

The inflow of higher saline water from the Kattegatt into the Baltic Sea between the 16th and 26th of January 2003 characterizes the situation in the near bottom layer of the western Baltic Sea, the Arkona Basin and the Bornholm Basin. Salinity in the near bottom layer in these regions was 2 psu to 4 psu higher compared to the values found in October

or February last year or to the long term means. In the Arkona Basin this saline water layer at the bottom had a thickness of 10 m to 20 m (see profile of station TF0113). The water in the bottom layer had a temperature between 2°C and 3°C and was rather cold compared to the values found in February or October last year.

Traces of saline water reached the Bornholm Basin around the 25/01/2003, indicated by slightly increased values for salinity and oxygen concentration close to the bottom. On the 10/02/2003 an increase in salinity of 2 psu and oxygen concentrations of 7 ml/l – 8 ml/l were found in the bottom layer (see profile of station TF0213). This water mass with higher salinity, higher concentrations of oxygen and a lower temperature had a thickness of about 10 m at station TF0213 and didn't change dramatically between 10/02/2003 and 16/02/2003. The water which had been located in the bottom layer before the saltwater inflow, was lifted up to a level of 60 m to 70 m. During this cruise there was no evidence that the saline water has already reached the Gotland Basin. Upcoming monitoring cruises will have to show possible effects of this saltwater inflow on the eastern Gotland Basin.
Concentrations of nitrate and phosphate in the bottom layer in the western regions of the Baltic Sea were in the range expected from long term observations and no clear signal from the saltwater inflow was obvious.

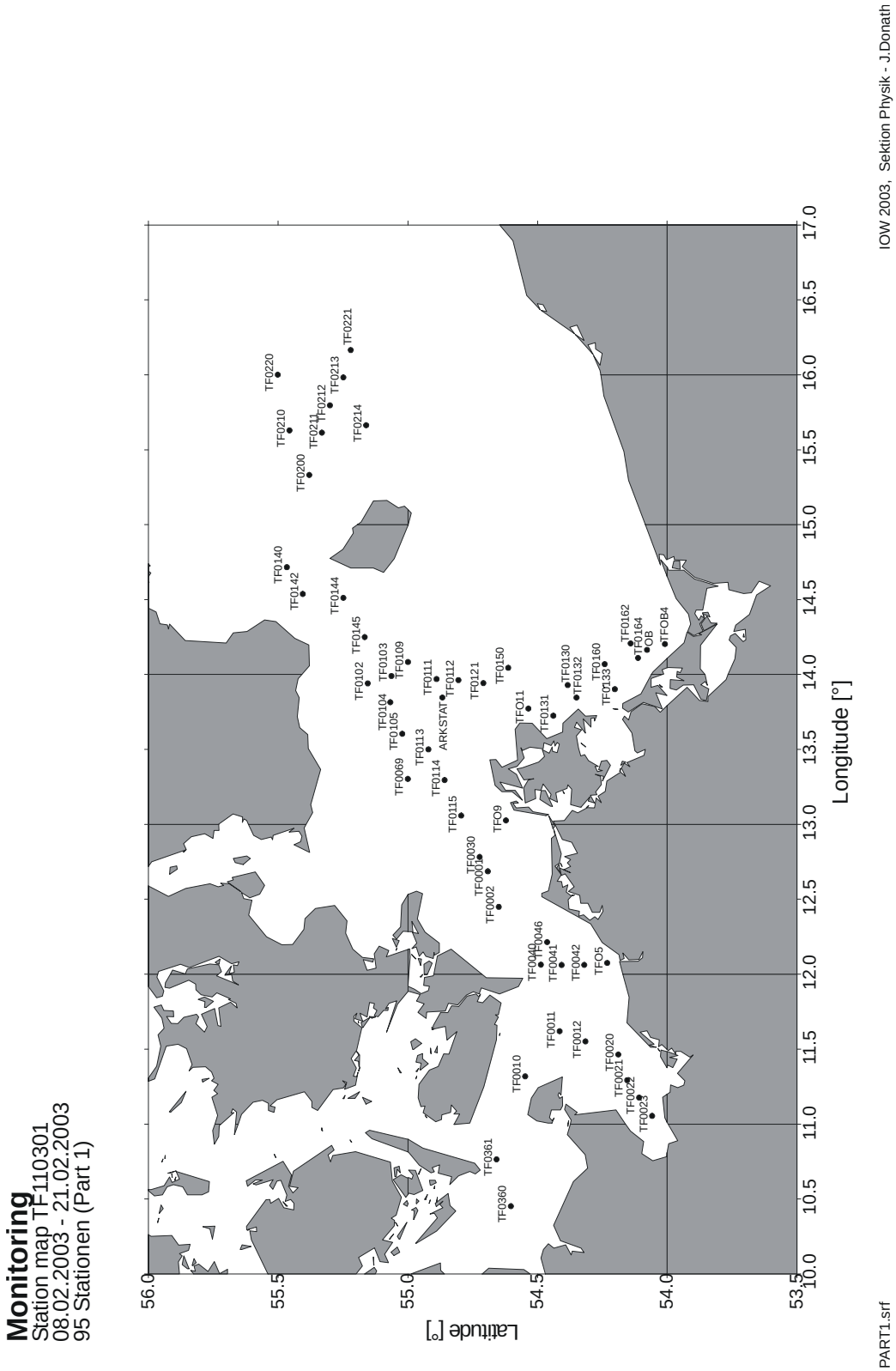
In the bottom layer of the eastern and western Gotland Basin no significant differences from the values measured in February or October last year were observed for salinity and temperature. Bottom temperature varying between 5°C and almost 7°C in this region are significantly higher compared to those in the western parts of the Baltic Sea in the higher saline water. At all stations in the Gotland Basin anoxic conditions were observed and H_2S concentrations measured in the near bottom layer were close to that found in October 2002. According to the amounts of H_2S, concentrations of phosphate were relatively high.

Klaus Nagel

Scientist in charge

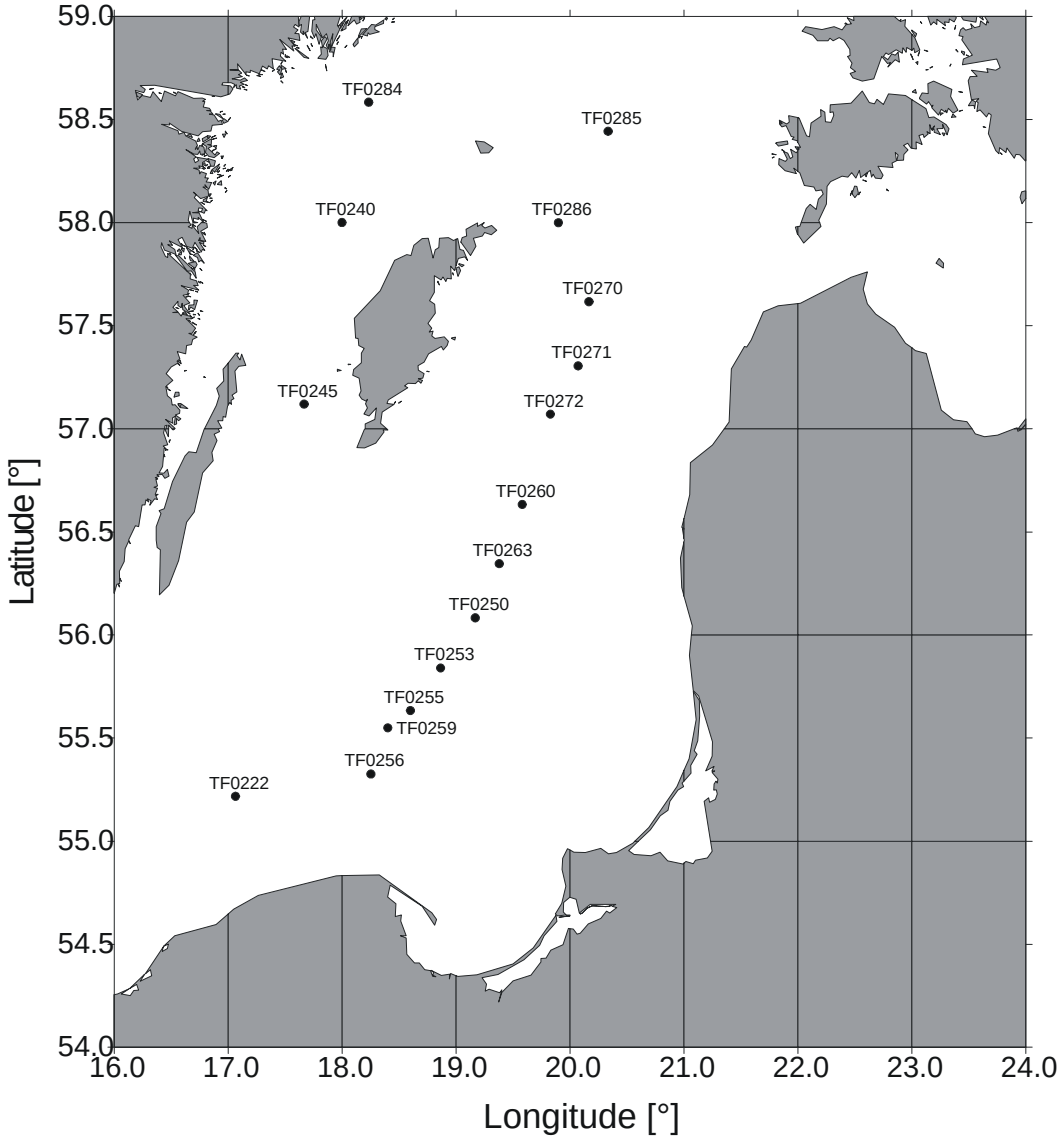
Attachments :

- track charts
- tables of preliminary results (surface layer and near bottom layer)
- comparison of actual data with mean values calculated from the measurements during the February cruises of the years 1971 – 1990 (surface layer and near bottom layer)
- transects of temperature and salinity between Kiel Bight and northern Gotland Sea
- map showing oxygen concentrations in near the bottom water layer
- profiles of salinity at station TF0113 (Arkona Basin)
- profiles of salinity and oxygen concentration at station TF0213 (Bornholm Basin)


Monitoring
Station map TF110301
08.02.2003 - 21.02.2003
95 Stationen (Part 1)
IOW 2003, Sektion Physik - J.Donath
PART1.srf
Latitude [°]
Longitude [°]
56.0
55.5
55.0
54.5
54.0
53.5
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
TF0220
TF0221
TF0210
TF0213
TF0212
TF0211
TF0214
TF0200
TF0140
TF0142
TF0144
TF0145
TF0102
TF0103
TF0109
TF0104
TF0111
TF0112
TF0105
TF0121
TF0150
TF0113
ARK-STAT
TF0069
TF0114
TF0115
TF0130
TF0132
TF0160
TF0133
TF0131
TF011
TF0162
TF0164
OB
TFOB4
TF009
TF0030
TF0002
TF0046
TF0041
TF0042
TF05
TF0011
TF012
TF0020
TF0021
TF0022
TF0023
TF010
TF0361
TF0360

Monitoring 2003

Station map TF110301
11.02.2003 - 21.02.2003
16 Stationen (Part 2)



Part2.srf

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Preliminary results of hydrographic and hydrochemical parameters at selected stations - **surface layer** -

Station **Date**	**Stat.Name** **Stat.No.** **)	**Temp.** **°C**	**Salinity** **PSU**	**NO_3** *) **µmol/l**	**PO_4** **µmol/l**	**SiO_4** **µmol/l**	**O_2** **ml/l**
Kiel Bight 08/02/2003	TF0360 2	1.20	18.51	6.27	0.50	12.25	8.71
Mecklenburg Bight 09/02/2003	TF0012 10	1.00	11.08	6.27	0.61	13.72	8.79
Lübeck Bight 09/02/2003	TF0023 6	1.06	16.89	7.49	0.47	14.08	8.74
Arkona Basin 10/02/03	TF0113 22	1.29	7.76	4.88	0.54	13.87	9.16
Pomeranian Bight 18/02/03	TFOB4 91	-0.13	6.73	29.99	0.77	35.85	9.60
Bornholm Deep 11/02/03	TF0213 41	2.16	7.52	3.68	0.56	12.98	9.38
Stolpe Channel 11/02/03	TF0222 45	1.68	7.04	3.36	0.56	12.84	9.57
SE Gotland Basin 12/02/03	TF0259 47	1.39	7.05	3.42	0.56	12.67	9.63
Gotland Deep 13/02/03	TF0271 54	1.00	7.02	3.72	0.62	13.65	9,19
Fårö Deep 14/02/03	TF0286 56	0.62	6.81	3.72	0.60	13.36	9.43
Landsort Deep 15/02/03	TF0284 58	-0.15	6.44	4.11	0.64	16.08	9.58
Karlsö Deep 15/02/03	TF0245 60	0.59	6.59	3.51	0.55	13.13	9.53

*) NO_3 is given as sum of NO_3^- and NO_2^- (in most samples NO_2^- was present only in traces)

**) see attached maps

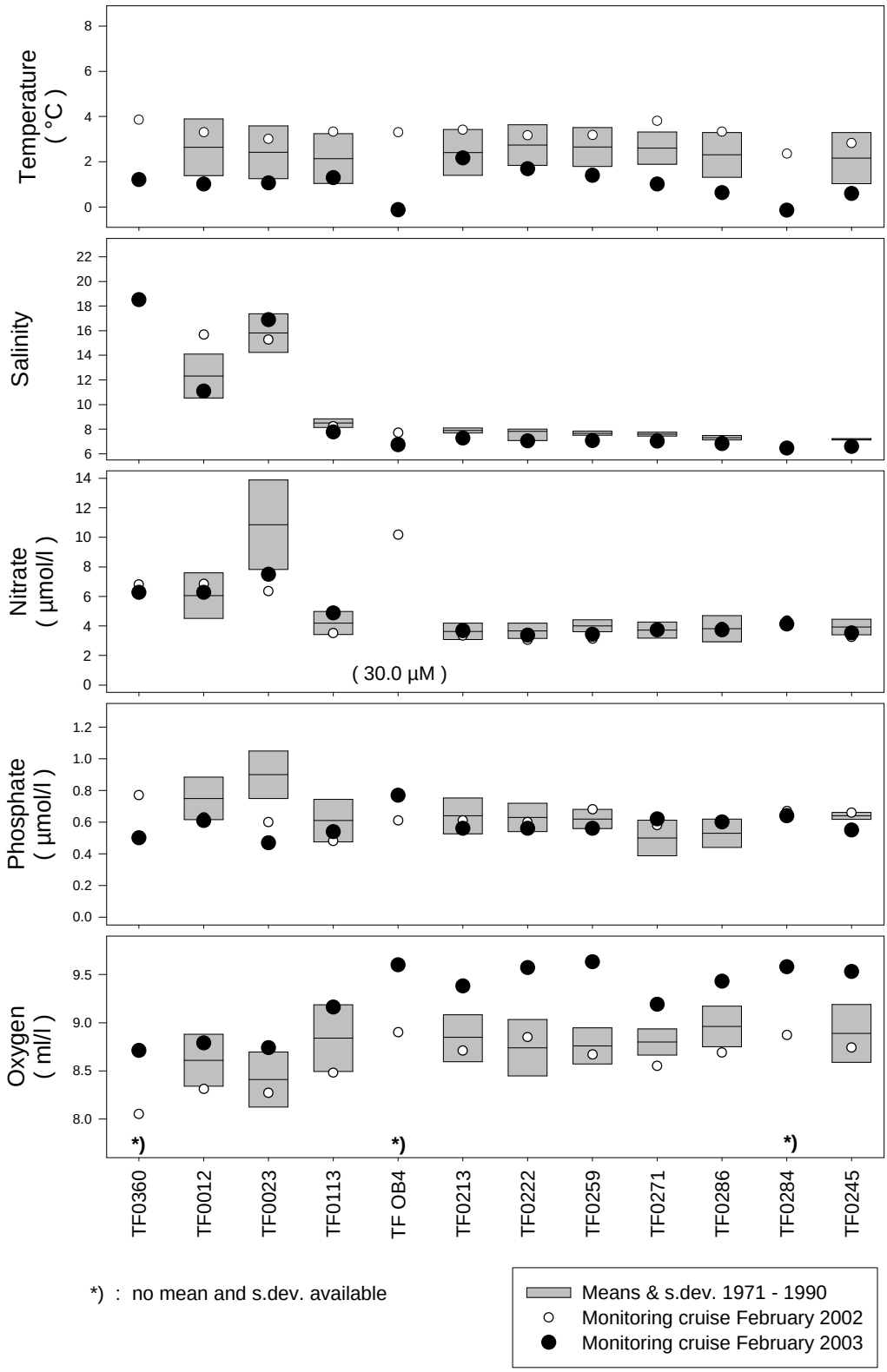
Preliminary results of hydrographic and hydrochemical parameters at selected stations – **near bottom layer** -

Station **Date**	**Stat.Name** **Stat.No. **)**	**Depth** **m**	**Temp.** **°C**	**Salinity** **PSU**	**NO_3 *)** **µmol/l**	**PO_4** **µmol/l**	**SiO_4** **µmol/l**	**O_2** **ml/l**
Kiel Bight 08/02/2003	TF0360 2	17.1	2.84	23.36	7.86	0.64	13.91	7.68
Mecklenburg Bight 09/02/2003	TF0012 10	23.1	2.52	23.59	7.82	0.68	17.48	7.00
Lübeck Bight 09/02/2003	TF0023 6	21.5	2.41	22.23	8.70	0.63	17.00	7.11
Arkona Basin 10/02/03	TF0113 22	44.1	2.70	20.77	8.24	0.72	15.93	7.55
Pomeranian Bight 18/02/03	TFOB4 91	10.0	0.50	7.16	19.35	0.86	31.75	9.08
Bornholm Deep 11/02/03	TF0213 41	87.3	3.09	18.53	8.36	0.89	18.19	7.45
Stolpe Channel 11/02/03	TF0222 45	88.4	6.83	14.02	7.52	2.43	41.57	3.41
SE Gotland Basin 12/02/03	TF0259 47	86.3	5.91	10.49	2.08	3.11	48.91	0.13
Gotland Deep 13/02/03	TF0271 54	236.9	6.36	11.97		6.60	86.01	-5.93 (H_2S)
Fårö Deep 14/02/03	TF0286 56	190.0	6.20	11.57		5.50	68.04	-3.18 (H_2S)
Landsort Deep 15/02/03	TF0284 58	435,6	5,44	10,27		3.80	55.39	-0.80 (H_2S)
Karlsö Deep 15/02/03	TF0245 60	107.4	5.02	9.74		4.20	54.42	-0.70 (H_2S)

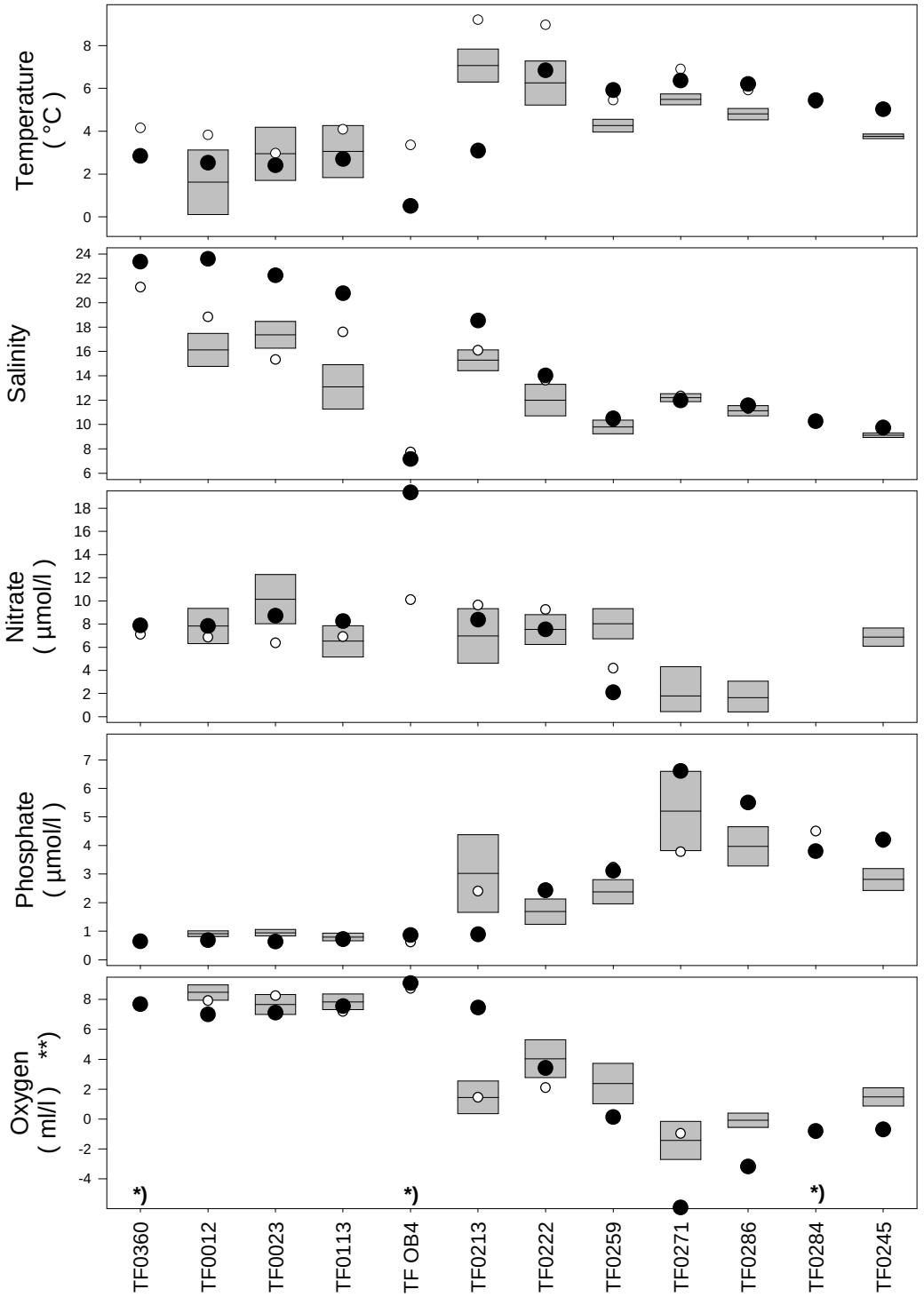
*) NO_3 is given as sum of NO_3^- and NO_2^- (in most samples NO_2^- was present only in traces)

**) see attached maps

Monitoring stations / February cruises : near-surface layer



Monitoring stations / February cruises : near-bottom layer

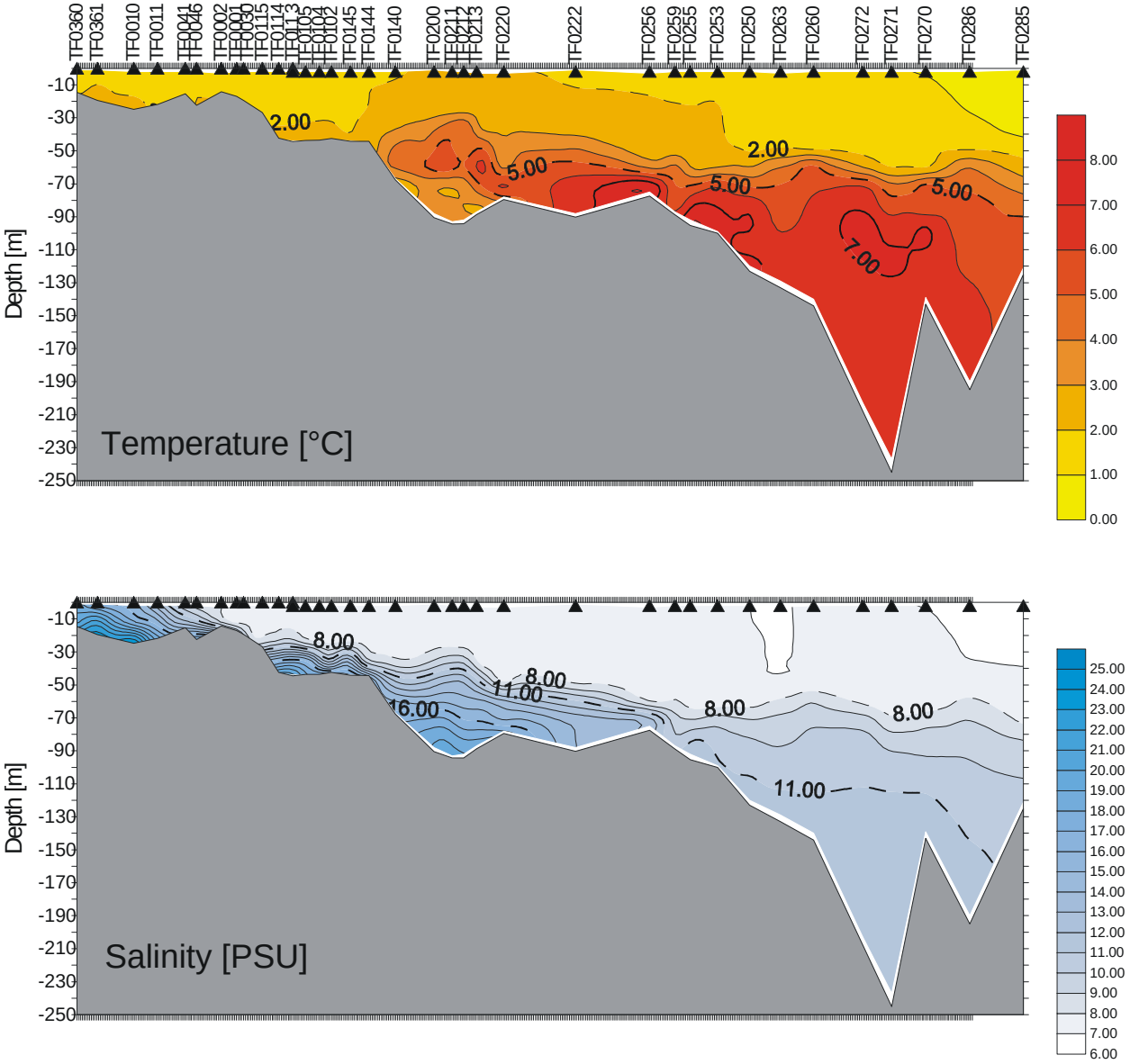


*) : no mean and s.dev. available
**) : H_2S was converted to negative O_2 equivalents

K. Nagel \ st_02302b \ ##/02/03

Gesamte Ostsee

TF110301
08.02.2003 - 21.02.2003



05_GEOST.srf

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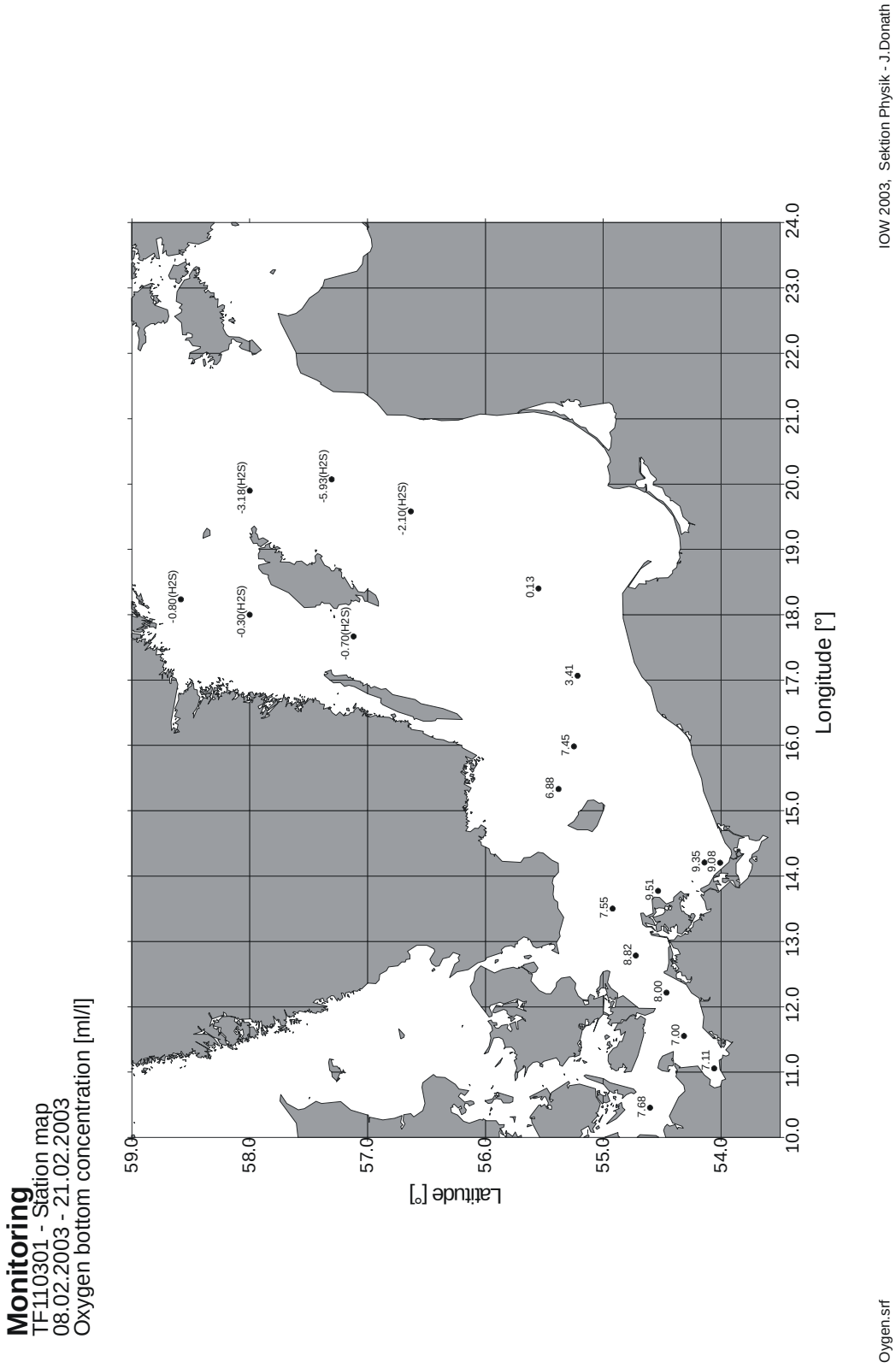
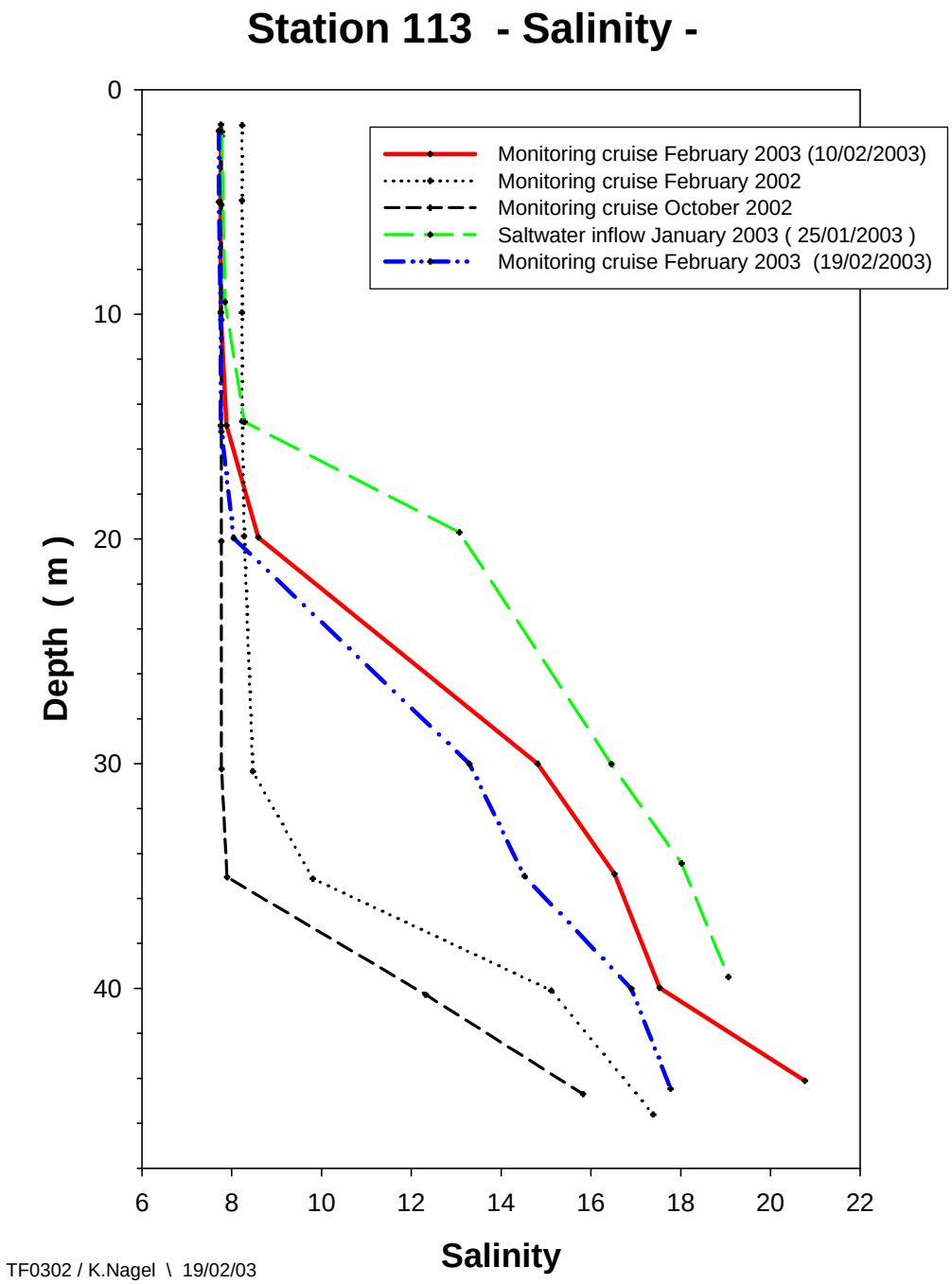
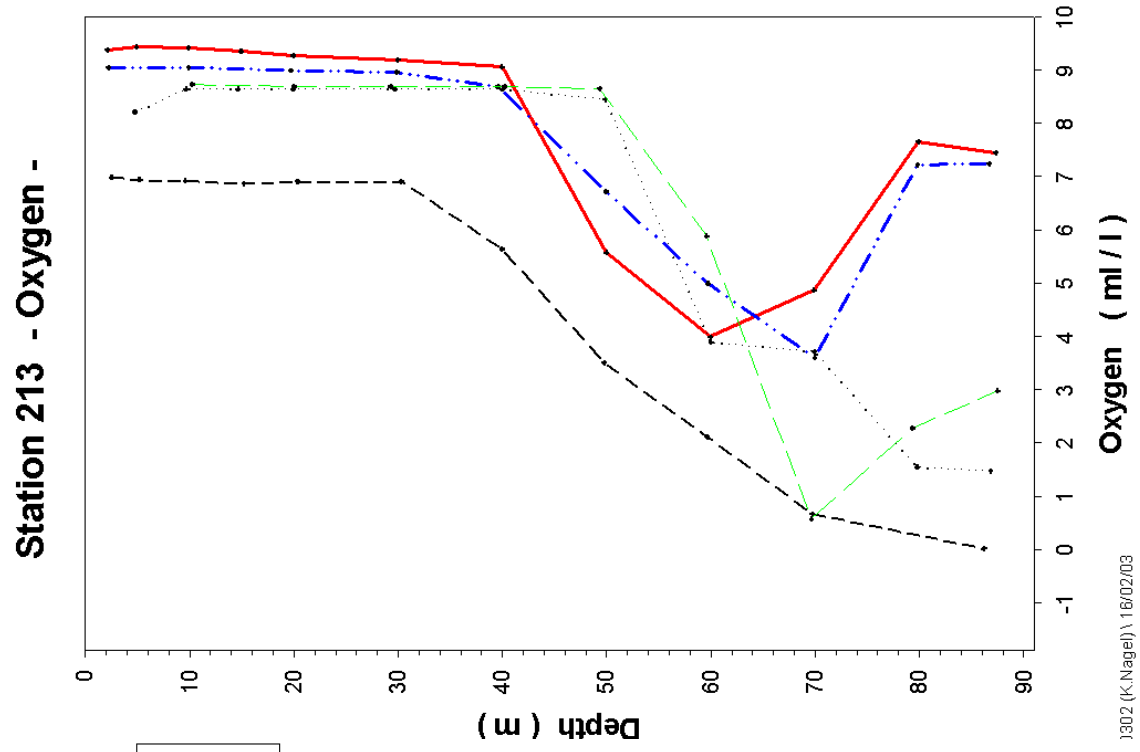
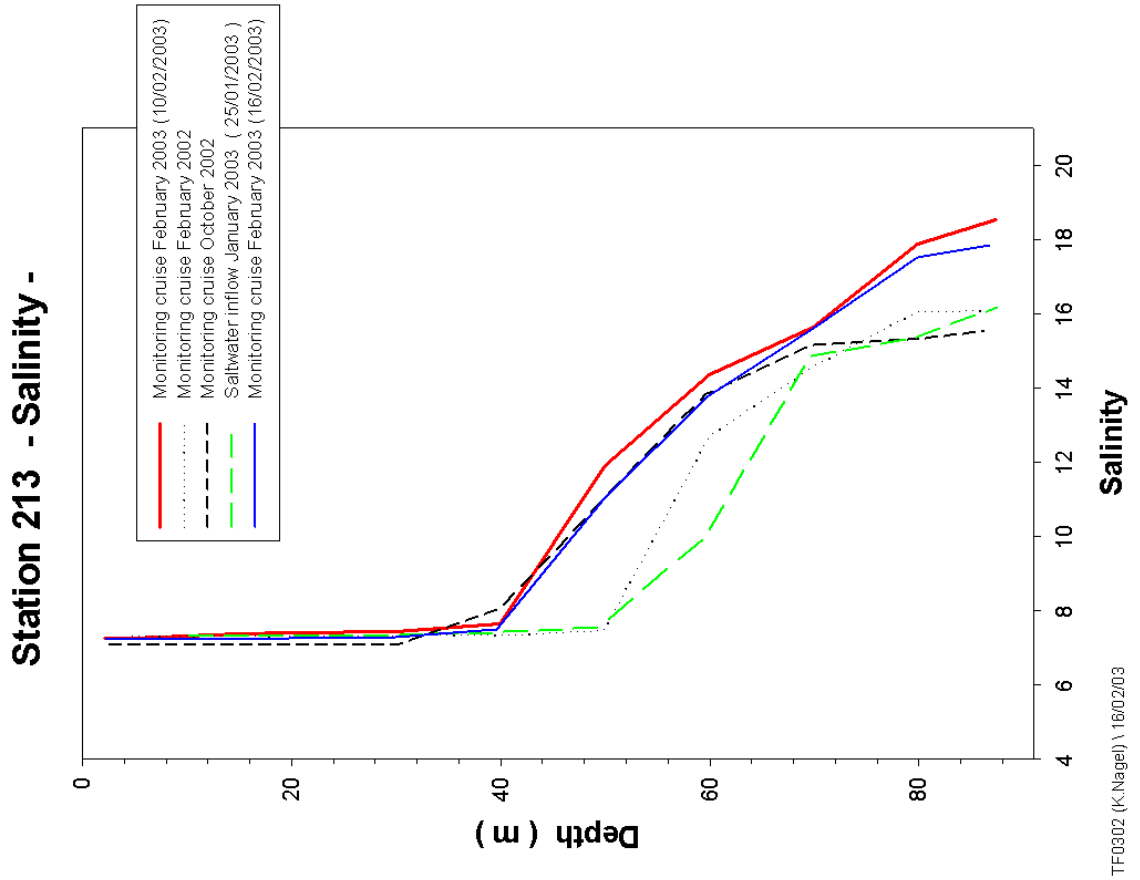

Monitoring
TF110301 - Station map
08.02.2003 - 21.02.2003
Oxygen bottom concentration [ml/l]
-0.80(H2S)
-0.30(H2S)
-3.18(H2S)
-0.70(H2S)
-5.93(H2S)
-2.10(H2S)
0.13
3.41
7.45
6.88
9.35
9.18
9.51
7.55
8.82
8.00
7.00
7.11
7.68
Latitude [°]
59.0
58.0
57.0
56.0
55.0
54.0
Longitude [°]
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
IOW 2003, Sektion Physik - J.Donath
Oygen.srf


Station 113 - Salinity -
Monitoring cruise February 2003 (10/02/2003)
Monitoring cruise February 2002
Monitoring cruise October 2002
Saltwater inflow January 2003 (25/01/2003)
Monitoring cruise February 2003 (19/02/2003)
Depth (m)
0
10
20
30
40
6
8
10
12
14
16
18
20
22
Salinity
TF0302 / K.Nagel \ 19/02/03


Station 213 - Oxygen -
Depth (m)
Oxygen (ml / l)
0
10
20
30
40
50
60
70
80
90
-1
0
1
2
3
4
5
6
7
8
9
10
TF0302 (K.Nagel) \ 16/02/03


Station 213 - Salinity -
Monitoring cruise February 2003 (10/02/2003)
Monitoring cruise February 2002
Monitoring cruise October 2002
Saltwater inflow January 2003 (25/01/2003)
Monitoring cruise February 2003 (16/02/2003)
Depth (m)
Salinity
0
20
40
60
80
4
6
8
10
12
14
16
18
20
TF0302 (K.Nagel) \ 16/02/03