Baltic Sea Research Institute Warnemünde

Cruise Report

R/V "ALKOR"

Cruise- No. 06AK / 07 / 01 ( AL293 )

05 February - 15 February 2007

This report is based on preliminary data

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1. **Cruise No.**: 06AK/ 07 / 01 ( AL293 )

2. **Dates of the cruise**: from 06/02/2007 to 15/02/2007

3. **Particulars of the research vessel**:
   - Name: r/v 'ALKOR'
   - Nationality: Germany
   - Operating Authority: Leibniz Institute of Marine Sciences at Kiel University (IFM - GEOMAR), Kiel

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 COMBINE program of HELCOM

7. **Crew**:
   - Name of master: J. P. Lass
   - Number of crew: 11

8. **Research staff**:
   - Chief scientist: Klaus Nagel
   - Participants:
     - Rainer Bahlo
     - Kerstin Bohn
     - Bärbel Buuk
     - Jan Donath
     - Ines Hand
     - Uwe Hehl
     - Ursula Hennings
     - Johann Ruickoldt
     - Erika Trost
     - Anna-Maria Welz

9. **Co-operating institutions**:
   All institutions dealing with the COMBINE program of HELCOM

10. **Scientific equipment**:
    - CTD
    - water samplers
    - plankton net
11. General remarks and preliminary results

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 64 stations according to the COMBINE program of HELCOM. The measurements were supplemented by continuous registration of standard meteorological parameters as well as surface water temperature and salinity.

For 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. Air temperature, air pressure, wind velocity as well as temperature and salinity in the surface layer are recorded continuously during the cruise and are shown in the attached figure.

The weather during the cruise was rather calm and warm for this time of the year. Air pressure varied between 995 hPa and 1020 hPa. In the Western Baltic and the Arkona Basin air temperatures fluctuate between 2°C and 1°C slowly decreasing down to almost -4°C in the western and eastern Gotland Basin. Easterly winds prevailed during the whole cruise with dominating wind speeds below 10 m/s. Only a few short periods with wind speeds between 10 m/s and 15 m/s have been observed. Highest wind velocities of more than 15 m/s were measured for a few hours on 09/02/07. Surface water temperatures were relatively constant between 3°C and 5°C in the area under investigation, only in the eastern Gotland Basin temperature dropped down to 2°C. Compared to the temperatures measured at the same time of the last year, temperatures during this cruise were higher at all stations (except Landsort Deep) and are also higher than expected from long term observations.

Except station TF0360 salinity in the surface layer was within the range expected from long term measurements in all regions of the Baltic Sea and varied around 12 in the western and 7 – 8 in all other areas. A halocline and thermocline was observed between 40 m and 50 m in the Arkona Basin, 50 m – 60 m in the Bornholm Basin and 70 m and 80 m in the Eastern and Western Gotland Basins. Salinity in the bottom layer was found between 16 and 22 in the Western Baltic, the Arkona Basin and the Bornholm Basin, while salinities between 10 and 13 were measured in the Eastern and Western Gotland Basins. These values were slightly above those expected from long term observations. Due to the saltwater inflows in the years before temperature in this saline bottom water layer was higher than the mean calculated from long term measurements, reaching values up to 9°C at the bottom of the Bornholm basin and Stolpe Channel.
The western Baltic Sea and the Arkona basin were well oxygenated down to the sea floor with oxygen concentrations varying around 8 ml/l. Due to the relatively high water temperature oxygen concentrations are slightly below the values expected from long term observations. Oxygen concentration in the Bornholm Basin dropped below 2 ml/l at depths below 70 m to 80 m, but no H₂S was found in this area. In the Eastern Gotland and western Gotland basin hydrogen sulphide was measured below 90 – 100 m in concentrations reaching up to 2.4 mg/l in the eastern and up to 1.2 mg/l in the western Gotland basin.

Nitrate concentrations in the surface layer were normal for this time of the year and vary between 2.4 µmol/l and almost 4.5 µmol/l, which is within the range expected from long term observations for most stations. Only at stations TF0360 and TF0012 nitrate concentrations of more than 9 µmol/l and 7 µmol/l, respectively, are found due to the inflow of high saline and nitrate rich water. Phosphate concentrations in the surface layer were close to those found at the same time one year ago and are in good agreement with the values expected from long term observations.

In the bottom layer concentrations of nitrate and phosphate are controlled by the presence of oxygen or hydrogen sulphide and lie in the expected range.

During this cruise samples for determination of biological parameters, trace elements and organic contaminants were taken for later analysis in the laboratory.

Klaus Nagel
Scientist in charge

Attachments:
- station charts
- tables of preliminary results for selected stations (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)
- figure showing continuously measured meteorological and hydrological parameters
- transects of temperature, salinity and oxygen concentration between Kiel Bight and northern Gotland Sea
- map showing oxygen concentrations in near the bottom water layer (hydrogen sulphide concentration is given as negative O₂ equivalents)
Monitoring Cruise No 06AK/07/01 (AL293)
r/v ‘ALKOR’

Institut für Ostseeforschung
Warnemünde

Monitoring
Station map 06AK0701 / Tf140701
06.02.2007 - 15.02.2007
15 Station (Part2)

Figure 2

K2.srf

IDW 2007, Sektion Physik - J.Donath

- 6 / 13 -
Continuous measurements of meteorological and hydrological parameters during the cruise 06AK/07/01 (AL293)

- Air temperature (°C)
- Air pressure (hPa)
- Wind velocity (m/s)
- Surface temperature (°C)
- Salinity surface layer

Date:
06/02/07 07/02/07 08/02/07 09/02/07 10/02/07 11/02/07 12/02/07 13/02/07 14/02/07

WB western Baltic Sea
AB Arkona Basin
BB Bornholm Basin
WGB western Gotland Basin
EGB eastern Gotland Basin

K. Nagel \ dtx_TF0702 \ 14/02/2007
Preliminary results of hydrographic and hydrochemical parameters at selected stations - surface layer -

<table>
<thead>
<tr>
<th>Station</th>
<th>Date</th>
<th>Stat.Name Stat.No. **)</th>
<th>Temp. °C</th>
<th>Salinity</th>
<th>NO₃ *) µmol/l</th>
<th>PO₄ µmol/l</th>
<th>SiO₄ µmol/l</th>
<th>O₂ ml/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiel Bight</td>
<td>06/02/2007</td>
<td>TF0360 5</td>
<td>4.66</td>
<td>19.73</td>
<td>9.43</td>
<td>0.70</td>
<td>16.5</td>
<td>7.65</td>
</tr>
<tr>
<td>Mecklenburg Bight</td>
<td>07/02/2007</td>
<td>TF0012 7</td>
<td>4.37</td>
<td>13.07</td>
<td>7.04</td>
<td>0.58</td>
<td>14.3</td>
<td>8.63</td>
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<tr>
<td>Arkona Basin</td>
<td>08/02/2007</td>
<td>TF0113 20</td>
<td>4.88</td>
<td>8.46</td>
<td>4.32</td>
<td>0.80</td>
<td>13.4</td>
<td>8.18#</td>
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<tr>
<td>Bornholm Deep</td>
<td>09/02/2007</td>
<td>TF0213 30</td>
<td>4.33</td>
<td>7.87</td>
<td>3.30</td>
<td>0.77</td>
<td>14.3</td>
<td>8.14</td>
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<tr>
<td>Stolpe Channel</td>
<td>10/02/2007</td>
<td>TF0222 31</td>
<td>4.50</td>
<td>7.99</td>
<td>3.41</td>
<td>0.76</td>
<td>12.8</td>
<td>8.09</td>
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<td>10/02/2007</td>
<td>TF0259 33</td>
<td>4.25</td>
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<td>0.75</td>
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<td>7.95</td>
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<tr>
<td>Gotland Deep</td>
<td>11/02/2007</td>
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<td>3.61</td>
<td>7.22</td>
<td>3.13</td>
<td>0.54</td>
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<td>8.17</td>
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<td>Fårö Deep</td>
<td>11/02/2007</td>
<td>TF0286 42</td>
<td>3.71</td>
<td>7.11</td>
<td>3.56</td>
<td>0.58</td>
<td>12.8</td>
<td>8.19</td>
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<tr>
<td>Landsort Deep</td>
<td>12/02/2007</td>
<td>TF0284 43</td>
<td>2.19</td>
<td>6.51</td>
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<td>0.68</td>
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<tr>
<td>Karlsö Deep</td>
<td>12/02/2007</td>
<td>TF0245 45</td>
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<td>3.80</td>
<td>0.74</td>
<td>15.3</td>
<td>8.32</td>
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</table>

*) NO₃ is given as sum of NO₃⁻ and NO₂⁻ (in most samples NO₂⁻ was present only in traces)
**) see attached maps
Preliminary results of hydrographic and hydrochemical parameters at selected stations – **near bottom layer** -

<table>
<thead>
<tr>
<th>Station</th>
<th>Stat.Name</th>
<th>Stat.No.</th>
<th>Depth</th>
<th>Temp.</th>
<th>Salinity</th>
<th>NO\textsubscript{3} *)</th>
<th>PO\textsubscript{4}</th>
<th>SiO\textsubscript{4}</th>
<th>O\textsubscript{2}</th>
<th>O\textsubscript{2} (H\textsubscript{2}S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiel Bight</td>
<td>TF0360</td>
<td>5</td>
<td>16.9</td>
<td>5.08</td>
<td>21.30</td>
<td>9.36</td>
<td>0.88</td>
<td>18.2</td>
<td>7.37</td>
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<td>06/02/2007 Mecklenburg Bight</td>
<td>TF0012</td>
<td>7</td>
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<td>4.73</td>
<td>19.06</td>
<td>10.80</td>
<td>0.68</td>
<td>18.7</td>
<td>7.33</td>
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<td>TF0113</td>
<td>20</td>
<td>45.7</td>
<td>7.36</td>
<td>17.87</td>
<td>10.08</td>
<td>0.99</td>
<td>21.7</td>
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<td>TF0213</td>
<td>30</td>
<td>85.9</td>
<td>9.37</td>
<td>16.26</td>
<td>8.85</td>
<td>1.94</td>
<td>45.0</td>
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<tr>
<td>09/02/2007 Stolpe Channel</td>
<td>TF0222</td>
<td>31</td>
<td>89.3</td>
<td>9.34</td>
<td>14.29</td>
<td>9.18</td>
<td>1.61</td>
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<td>10/02/2007 SE Gotland Basin</td>
<td>TF0259</td>
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<td>3.08</td>
<td>62.6</td>
<td>-1.70 (H\textsubscript{2}S)</td>
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<td>11/02/2007 Fårö Deep</td>
<td>TF0286</td>
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<td>189.8</td>
<td>5.99</td>
<td>12.05</td>
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<td>59.5</td>
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<tr>
<td>11/02/2007 Landsort Deep</td>
<td>TF0284</td>
<td>43</td>
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<td>5.75</td>
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<td>3.61</td>
<td>55.6</td>
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<td>12/02/2007 Karlsö Deep</td>
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<td>45</td>
<td>107.2</td>
<td>5.22</td>
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<td>4.26</td>
<td>58.7</td>
<td>-1.66 (H\textsubscript{2}S)</td>
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</tbody>
</table>

*) \( \text{NO}_3 \) is given as sum of \( \text{NO}_3^- \) and \( \text{NO}_2^- \) (in most samples \( \text{NO}_2^- \) was present only in traces)

**) see attached maps
Monitoring stations / February cruises: near-surface layer

Temperature (°C)

Salinity

Nitrate (µmol/l)

Phosphate (µmol/l)

Oxygen (ml/l)

*) : no mean and s.dev. available

Means & s.dev. 1971 - 1990
Monitoring cruise February 2006
Monitoring cruise February 2007
Monitoring stations / February cruises: near-bottom layer

**Temperature (°C)**

**Salinity**

**Nitrate (µmol/l)**

**Phosphate (µmol/l)**

**Oxygen (ml/l)**

*) : no mean and s.dev. available

**): H₂S was converted to negative O₂ equivalents

K. Nagel \ st_0702b \ 14/02/07