Cruise Report

F.S. ALKOR Cruise No. 289

Dates of Cruise: 05. Oct. to 07. Oct. 2006

Projects:
Student course in phys. oceanogr.

Areas of Research: Physical oceanography

Port Call: None

Institute: IFM-GEOMAR Leibniz-Institut für Meereswissenschaften an der Universität Kiel

Chief Scientist: Dr. Johannes Karstensen

Number of Scientists: 12

Master: Hechler

Chapter 1

Scientific personal

Cruise code: AL 289
Cruise dates: 05.10. – 07.10.2006
Port calls: Kiel - Warnemünde - Kiel

Table 1.1: Scientific personal on AL280: IFM-GEOMAR: Leibniz-Institut für Meereswissenschaften an der Universität Kiel, Kiel, Germany (PO: Physical Oceanography lab; AvH: Alexander von Humboldt Stipendiant); CAU: Christian Albrechts Universität Kiel, Kiel, Germany

Name	Institute	Function
Johannes Karstensen	IFM-GEOMAR	Chief scientist
Andreas Pinck	IFM-GEOMAR	PO
Jens G. Fischer	IFM-GEOMAR	PO
Fritz Karbe	IFM-GEOMAR	PO
Aneurin Henry-Edwards	IFM-GEOMAR	AvH
Chrisitina Roth	CAU	student
Julia Pichowski	CAU	student
Benjamin Gutknecht	CAU	student
Georg Drees	CAU	student
Marieta Miteva	CAU	student
Ronald Stegen	CAU	student
Toni Schröder	CAU	student

Responsible for Report:
Johannes Karstensen phone: ++49 (0)431 600-4156
Leibniz-Institut für Meereswissenschaften fax: ++49 (0)431 600-4152
Dï¿½sternbrooker Weg 20 e-mail: jkarstensen@ifm-geomar.de
24105 Kiel, Germany

Chapter 2

Scientific Background

ALKOR cruise AL289 was three day cruise and the last student cruise in 2006. The scientific motivation of the cruise was to obtain a rather synoptic picture of the hydrography and water movement in the western Baltic and to maintain a mooring site at the southeastern opening of the Fehmarn Belt.

In general two section have been occupied: one section crossing the Fehmarn Belt (section ’C’) and one section following the deepest topography from about 10°40 E to 14°21 E (section ’L’). Along both sections CTD/rosette sampling was performed as well as continuously recording of current velocities using a vessel mounted ADCP.

A mooring site (V431) is maintained (battery change, data read-out), located at the southeastern opening of the Fehmarn Belt. The mooring consists of a Workhorse-ADCP (300 kHz), and a self containing CTD (Type MicoCat) mounted in a commercial shield (Flotation Technology).

Besides the scientific motivation, the cruises are utilized for educational purposes. Undergraduate students are introduced into modern observational techniques of physical oceanography, basics in instrument calibration and interpretation of the observations. In addition the observations should give the students the opportunity to experience work and life at sea and to explore/investigate the Baltic Sea, the ’ocean’ at their back-yard.

Chapter 3

Cruise Narrative

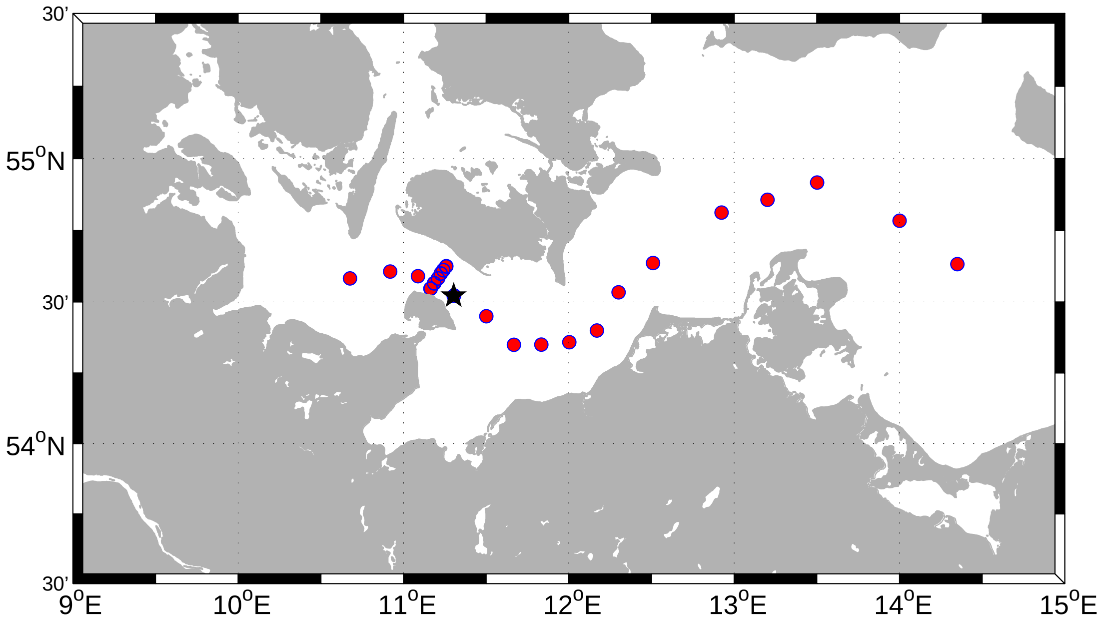

Figure 3.1: ALKOR 289 cruise track (black line, based on DATADIS recordings). Red dots are the CTD stations, black star is the location of the V431 mooring.

DAY 1 (Thursday, 05.10.2006):
We left IFM-GEOMAR pier (Westufer) at 08:00 (all times given in the narrative are ALKOR local time; MESZ) with 12 'scientists' on board, 5 were undergraduate students in physical oceanography, one was a geophysicist.

Originally it was planned to start the cruise on the 4th October, the day after the "3th October" festival in Kiel. However, as ALKOR had 'open ship' days on the 2nd and 3rd, the 4th was needed to remove most exhibition material from the ship. Only a Bottom Lander and a multi-corer device have been left on the aft-deck for the following cruise.

After leaving Kiel the first officer (J. Kranich) introduced the students into the safety-on-board procedures and familiarized them with the ship. Next a brief introduction into the program for the days was given.

At around 10:00 we started sampling the first two CTD stations for the zonal section ('L'). A rather large volume of water was collected at the station 1 and used as 'Substandard'. In the following days the 'Substandard' was used to monitor the stability of the salinometer (see details below). Next the Fehmarnbelt section ('C') was sampled with a northward CTD section and a repeat section using the ADCP with 7 kn. After finishing the section, we headed for the V431 mooring at the southeastern opening of the Fehmarnbelt. In parallel to the CTD work the meteorological observations were made. Unfortunately the meteorological sensors on board ALKOR are still not as well maintained and in addition only in part being integrated in the data distribution system (DATADIS).

Around 16:00 the release command was send 2 times but it took about an hour and sending a few more release commands to finally spot the mooring. In fact, the cook was the first spotting it from the pantries bull-eye as it drifted just next to the ship. In the vicinity of the V431 mooring position a CTD cast was performed for calibration purposes.

Further stations of the 'L' section have been occupied (up to station #12) until 21:00. The night was used to stem to the eastern most position northeast of the island of Rügen, at the edge of the Arcona Basin.

DAY 2 (Friday, 06.10.2006):
At 07:30 we started CTD work again heading from east to west with meteorological observations in parallel. In addition the salinometer work begun. Samples need to be stored one day to allow for a temperature adjustment to lab temperature.

Over night the wind increased up 7 Bft but fortunately from southern directions. Thus no problems occurred in performing the CTD work. In general no problems occurred during the day and we made all remaining CTD of the 'L' section and slowly heading back the Fehmarnbelt. CTD work was stopped at 22:00 north of Warnemünde and we slowly moved northwestward to redeploy the mooring and do a second 'C' section occupation on the following day.

DAY 3 (Saturday, 07.10.2006):
The 15th deployment of the V431 mooring was scheduled for 06:00 and at 06:15 the instrument was launched 'free fall'. A CTD calibration cast at the V431 mooring site followed. Next we headed north-westward with less than 8 kn to the northernmost position of the Fehmarnbelt 'C' section doing an ADCP section. The slow speed over ground improves the quality of the ADCP measurements.

A re-occupation of the CTD 6 stations followed and allow a comparison with the first occupation order two days ago.

After the CTD section was occupied the scientific program was completed at 10:00 with stopping the ADCP and the TSG. ALKOR reached Kiel (IFM-GEOMAR pier Westufer) at 13:00.

Chapter 4

Preliminary results

4.1 Mooring V431: 14th deployment period

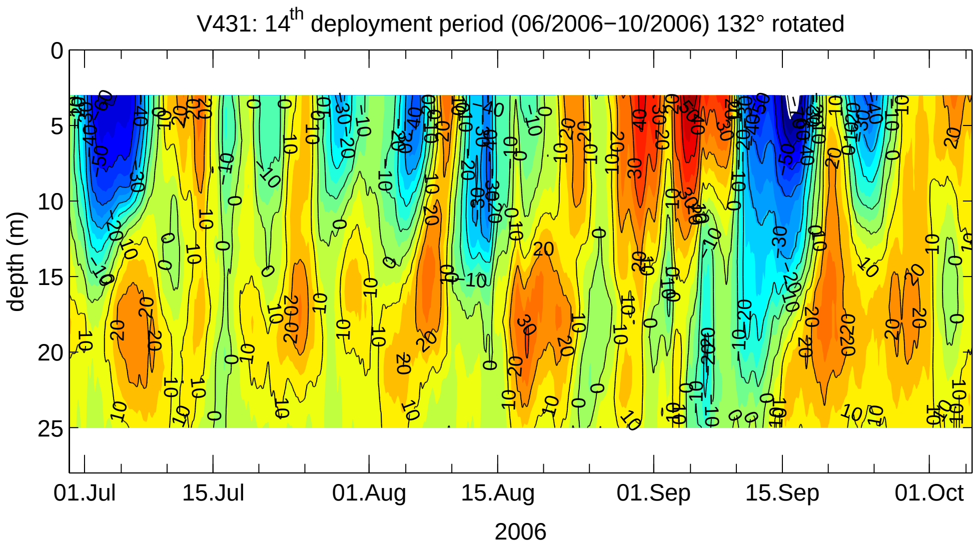

Figure 4.1: Mooring V431, upward looking Workhorse 300kHz ADCP - along bathymetry velocity (rotated to 132°). Values are linear averaged over 7 days.

The ADCP is placed at the bottom (about 28m water depth) and measure upward looking. Data points are obtained in 1 m depth cells averaged over 0.5 hours, pinging every 0.5 minutes (30 seconds). A rotation of the velocities by 132°makes one component parallel and one perpendicular to the topography. The current component parallel to the topography is shown in the upper figure. Alternating currents of southeast/northwest directions can be seen. The lower part of the water column is generally into the Baltic, while the upper part is in and out of the Baltic. The minimum in fluctuations is at about 13 to 14m depth. Note, currents above about 6m depth are influence through the surface reflections (and side lopes) and the data is corrupt.

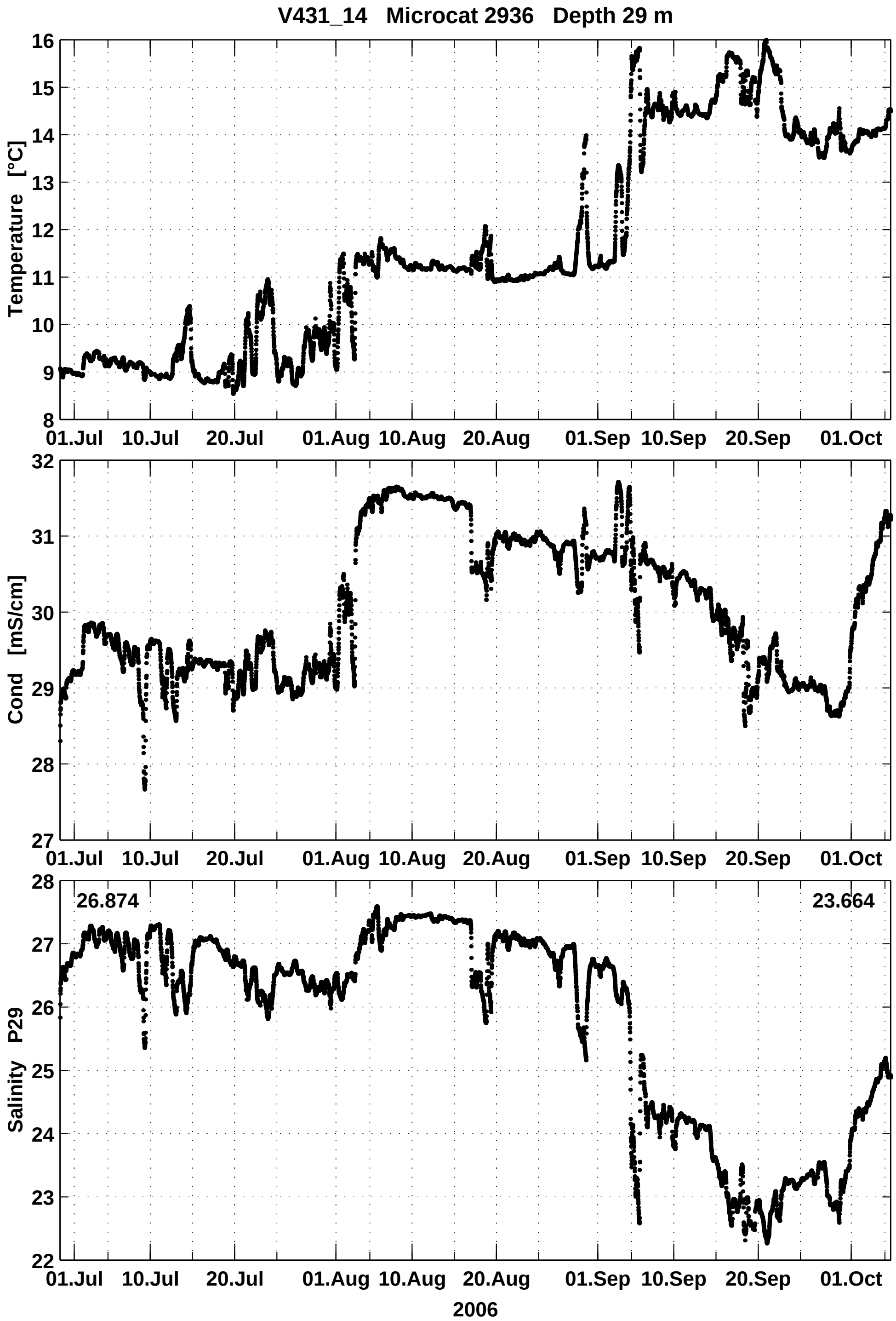

Figure 4.2: Time series of Temperature (upper), conductivity (middle), and derived salinity (lower) from the 13th and 14th deployment period.

4.2 Meteorological observations

General weather situation (figure 4.3): During the 3 days of our expedition, there was a high pressure system over the whole Baltic Sea domination the weather. This system was moving eastwards very slowly.

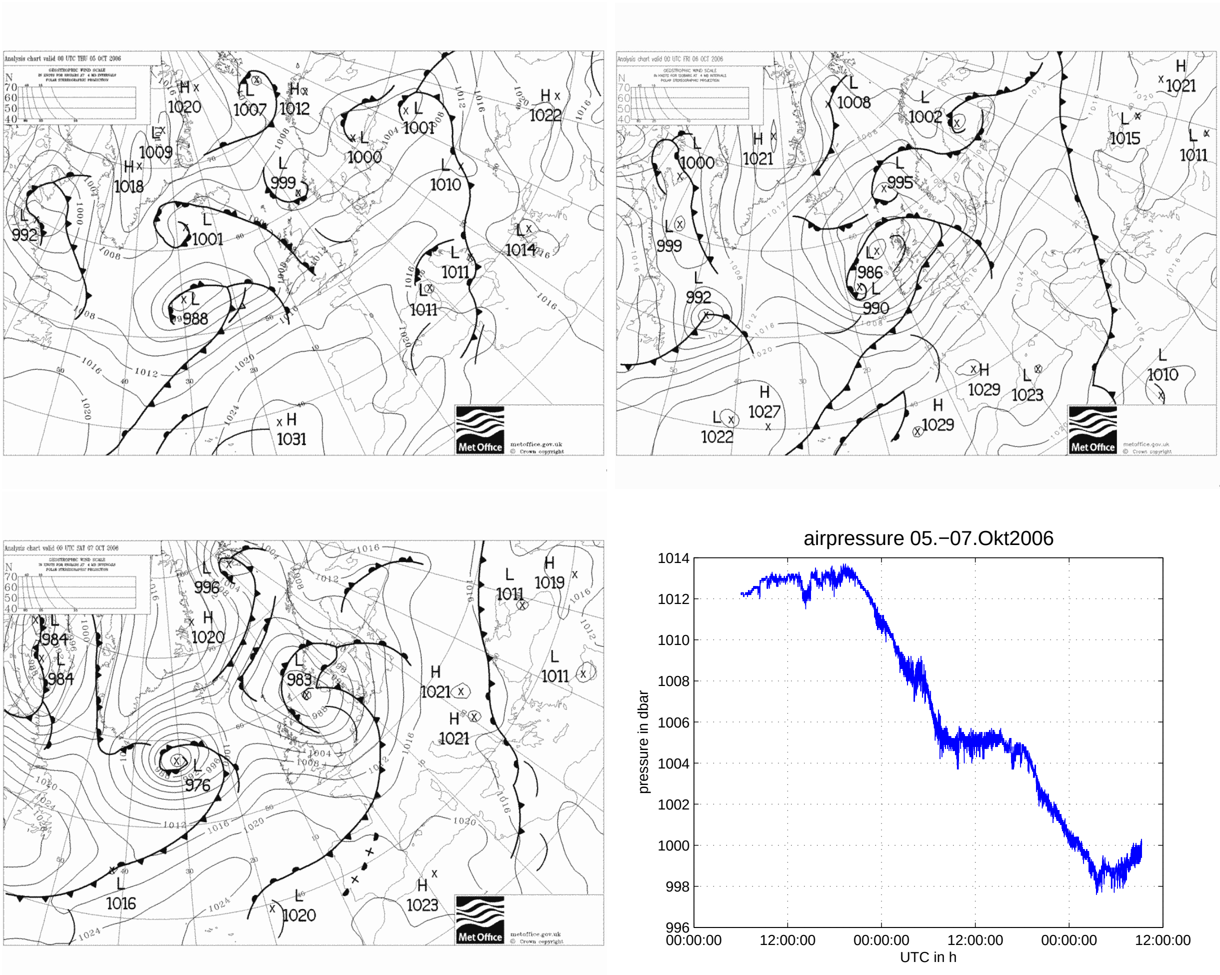

Figure 4.3: Weather chart from 5.– 7.October 2006 based on Bracknell-Data, Recorded air pressure (lower right)

About the three days of our trip an decrease of pressure is to observe. At the beginning there are low pressure areas above Iceland (1001 hPa), Norway (999 hPa), Finland (1000 hPa) and above the Northatlantic (988 hPa) (Fig. 4.3). To the end of our trip they develop into two stronger ones above the Northatlantic (976 hPa) and the North Sea (983 hPa), their influence reached up to the Baltic Sea. At 5. Oct. the pressure was nearly constant about 1013 hPa (Fig. 4.3), sank in the night to approximately 1005 hPa, stabilized there and sank again in the second night to its minimum at 998 hPa. This development is equal to the described trend of the low pressure areas above. At last of the series of measurement we observed an low increase to 1000 hPa.

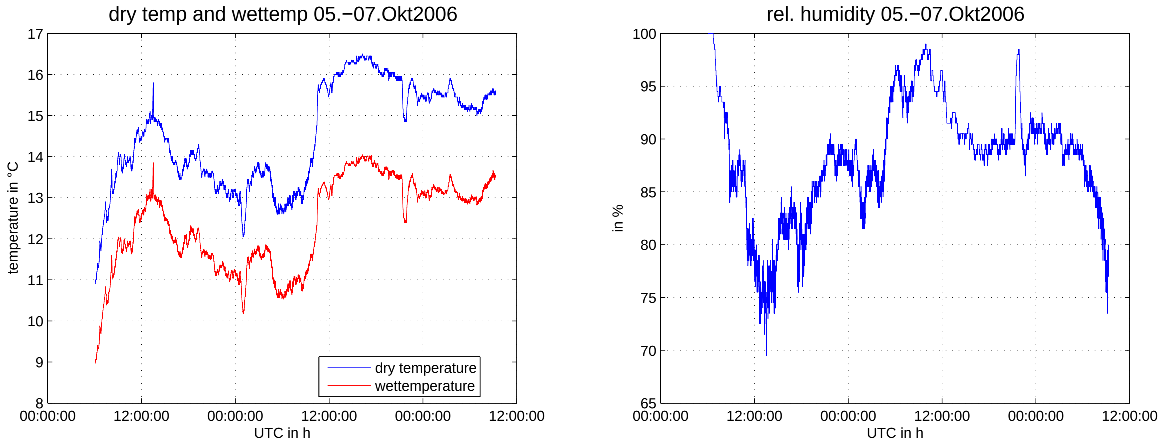

Figure 4.4: Dry and wet air temperature (left) and relative humidity (right)

During our trip the range of temperature was from 11°to 16.5°, in which lowest values was reached at the beginning,the maximum value was recorded at afternoon of 6. October (Fig. 4.4). As from second day generally temperatures are increased. Because of the warmth of a warm front, which drafted across the Baltic Sea from Denmark to Russia (Fig. 4.3, Day 6./7.). The graph of the temperature has a diurnal course for both days. In the night of 6. October you observe a low increase about 2°. We interpret this as the development of the warm front's sector. So since 6. October the temperature was 2°higher than before and stayed at this level. The course of wet temperature is parallel to this of dry temperature with a general offset of circa 2°. This came from cooling through evaporation at the wet thermometer.

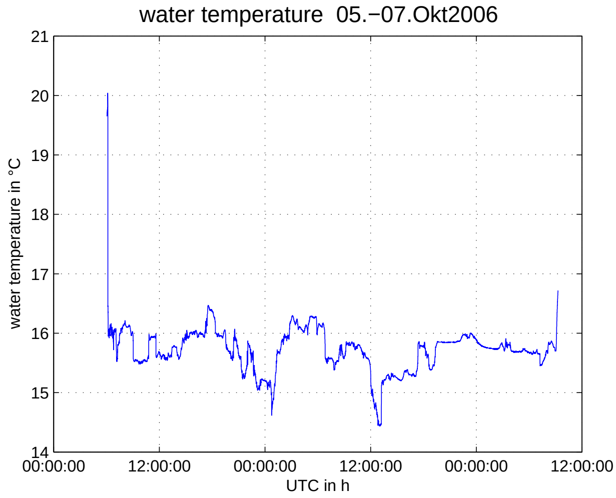

Figure 4.5: Water temperature from TSG during AL 289.

We measured values between 14.4°and 16.5°maximum (Fig. 4.5). At noon on the 5. October and on midnight at the next day there are the lowest values. For both we assume a development of the precipitation and strong winds at this time. Switching on and out the instrument (Thermosalinograph) has an effect of the data, so we neglect the high values at the beginning and the end of measurement. (Both values are incorrect.)

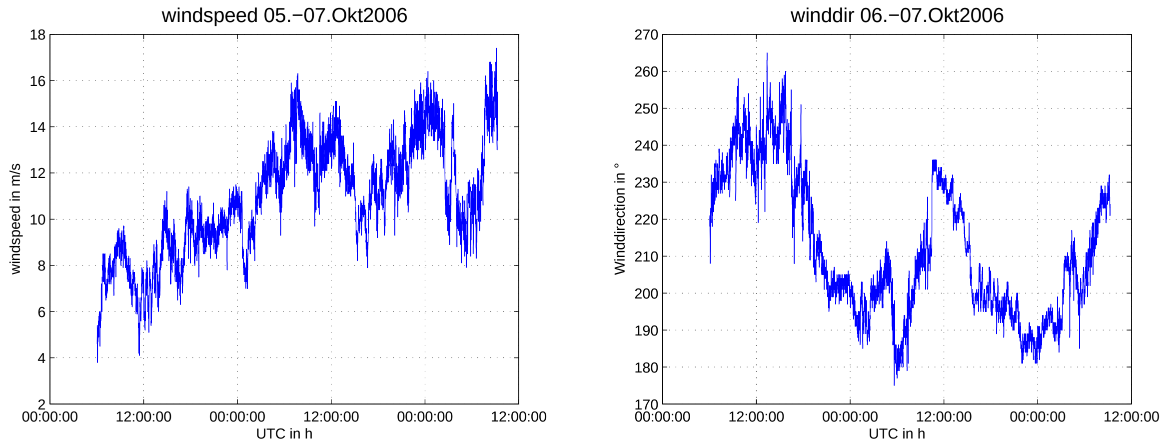

Figure 4.6: Wind speed (left) and Wind direction (right)

The range of wind speed is from nearly $0\,\mathrm{m^2\,s^{-1}}$to $23\,\mathrm{m^2\,s^{-1}}$(Fig. 4.6, left). For both days there is an increase and decrease of wind speed. A reason for this could be, that we always were near to a coast under influence of the land-sea-system. Land heat is much stronger at day but also has stronger cooling at night. So there is a semi diurnal difference of pressure between air masses above land and air masses above ocean at morning and evening. This pressure gradient generates wind who's magnitude depends on the difference of temperature which causes the pressure gradient. This system is to observe on every coast and it is reaching sometimes more than hundred kilometres into the open ocean.

Generally at the first day the wind came from the south west and changed at evening to wind from the south, south west. At the first and the second night you can see a section of constant wind from south . In the morning hours of 7. October before sunrise the mean wind direction was to east. When you look at the weather chart (Fig. 4.3) the isobars run to north and west respectively. Because of wind blows from stronger isobar to lower matches the values with the interpretation of weather charts.

There is a distinctive daily course to note inside the measurement of the incoming short wave radiation (Fig. 4.7, left). At night there is no incoming radiation at all. The maximum value is just under $160\,\mathrm{W\,m^{-2}}$the 5. October 2006. All daily maximum values are reached about noon, without difference in characteristic of rising and falling edge. The lower maximum on 6. October ($100\,\mathrm{W\,m^{-2}}$) is reasonable in more intense cloudiness.

After sunset the outgoing long wave radiation does not stop, at night the instrument recorded no permanent minimum (Fig. 4.7, right). The rate of outgoing long wave radiation is not only depending on the short wave radiation, which reaches the ocean surface. One other factor, which determines it, are clouds, they reflect the radiation back to the earth surface and also of the ocean

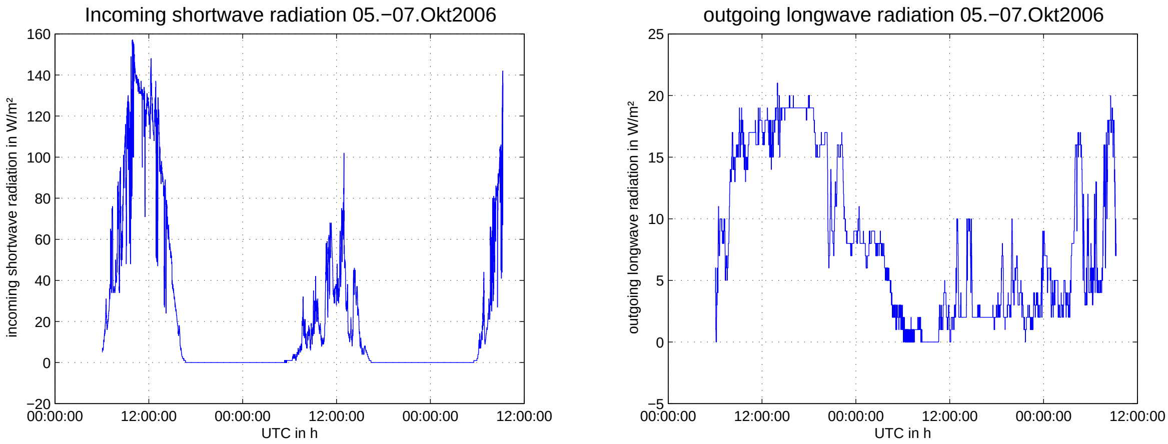

Figure 4.7: Incoming short-wave radiation (right) and outgoing long-wave radiation (left)

temperature. At the 5. October there was an higher rate of outgoing than on the next day, because of the higher rate of solar radiation, because next day it was more cloudy.

Sensible heat flux indicates the lost of energy in form of warming the air. So principal the flux is negatively signed (Fig. 4.8 left). During our trip sensible heat range was from ca. -65 $\mathrm{W\,m^{-2}}$ (morning 6.Oct.) to 38 $\mathrm{W\,m^{-2}}$ (noon 6.Oct). We see from the plots of water temperature and air temperature, the water temperature decrease ca. 1.5°and at the same time air temperature increases ca. 2°. So at this time the gradient of temperature in the bulk formula for sensible heat was negative and so in heat balance positive. We had a win of sensible heat for the Baltic Sea.

At the flux of latent heat energy goes into evaporation of water (Fig.6 right). It does not result in warming of air. That is why it is called latent. Energy is bounded to kinetic energy of water molecules in vapour. So it only will be release at condensation. Most time latent heat flux is a loss for oceans, also at our trip. We had a range from -150 $\mathrm{W\,m^{-2}}$to 20 $\mathrm{W\,m^{-2}}$in which the positive value is reached only one time at noon 6. Oct., again. There we had precipitation and seeming so much, that more energy went into ocean instead of out. At the end of measuring we had a concisely loss of latent heat. But thus that measurement stopped there, it is not possible to say if that is a correct development or if an instrument had a malfunction.

The heat balance varies between values of -130 $\mathrm{W\,m^{-2}}$ and 120 $\mathrm{W\,m^{-2}}$ on our trip (Fig. 4.8, centre). At noon on the first day the values reached a maximum in gain. After noon the Baltic sea losses half a day, but at noon of the 6. October it wins (55 $\mathrm{W\,m^{-2}}$) for a few hours. Than we recorded loss, because of the strong winds, precipitation and no incoming short wave radiation at this time. All factors are loss sources of energy, in form of incoming radiation and latent and sensible heat, for the Baltic Sea.

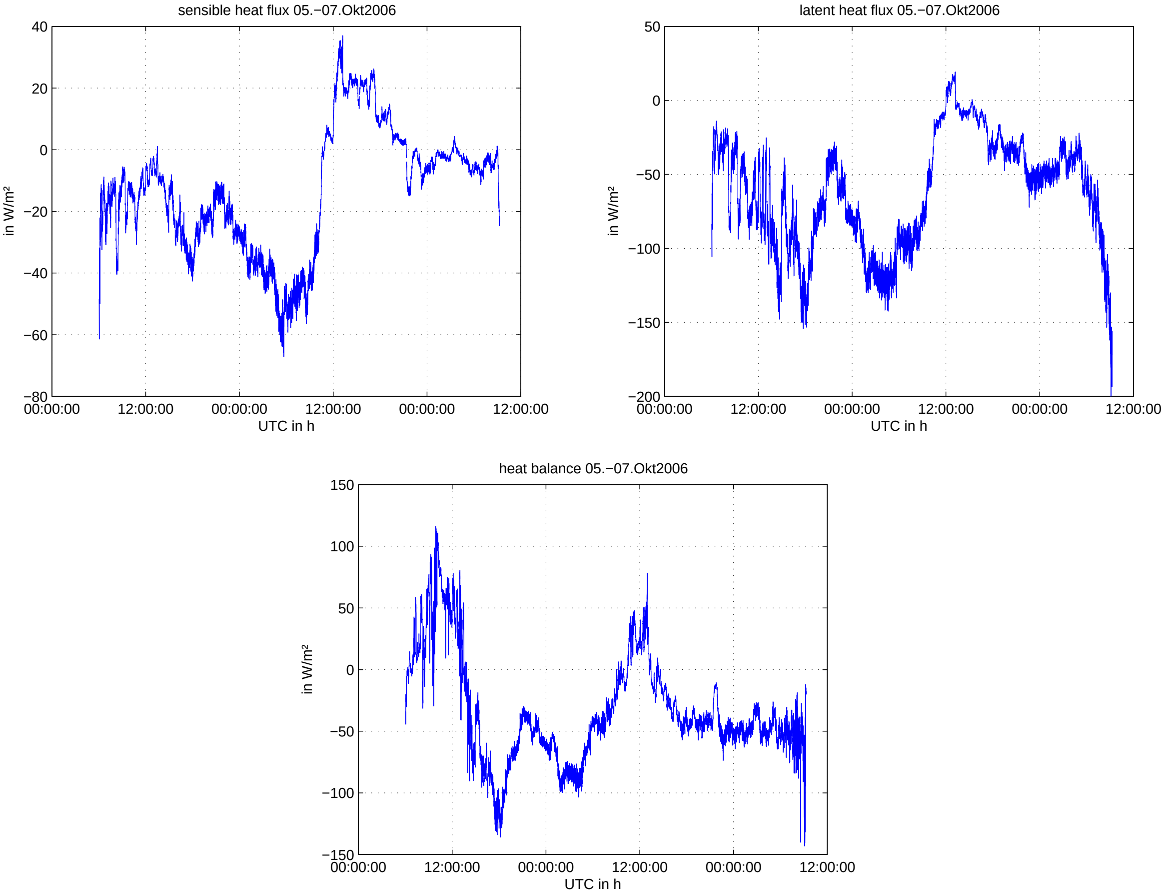

Figure 4.8: Sensible heat flux (left), latent heat flux (right) an d heat balance including short wave and long wave radiation and sensible and latent heat fluxes (centre)

4.3 Hydrographic and currents along C and L section

4.3.1 Fehmarnbelt (C section)

There was not much difference between the two crossings of the Fehmarn Belt on the 05.10. and the 07.10.2006 and both sections are discussed here in parallel. The temperature distribution (figure 4.9, upper) across Fehmarnbelt is quite homogeneously. There is a warm layer in the upper five meters in the south and the upper ten meters in the north, with temperatures about 14.7°C. Beneath, there is a layer about five meters with the temperate maximum at about 15°C. From there to the ground the temperature decreases continuously. The temperature minimum at the deepest point in the Fehmarnbelt is about 12.2°C.

The salinity distribution (figure 4.9, middle) shows typical stratification with more salty water of North Sea origin is overlayed by fresher water of Batic origin. At the surface the salinity is about 12 to 13 and on the ground about 22 to 23. There is a slope from south to north as earlier

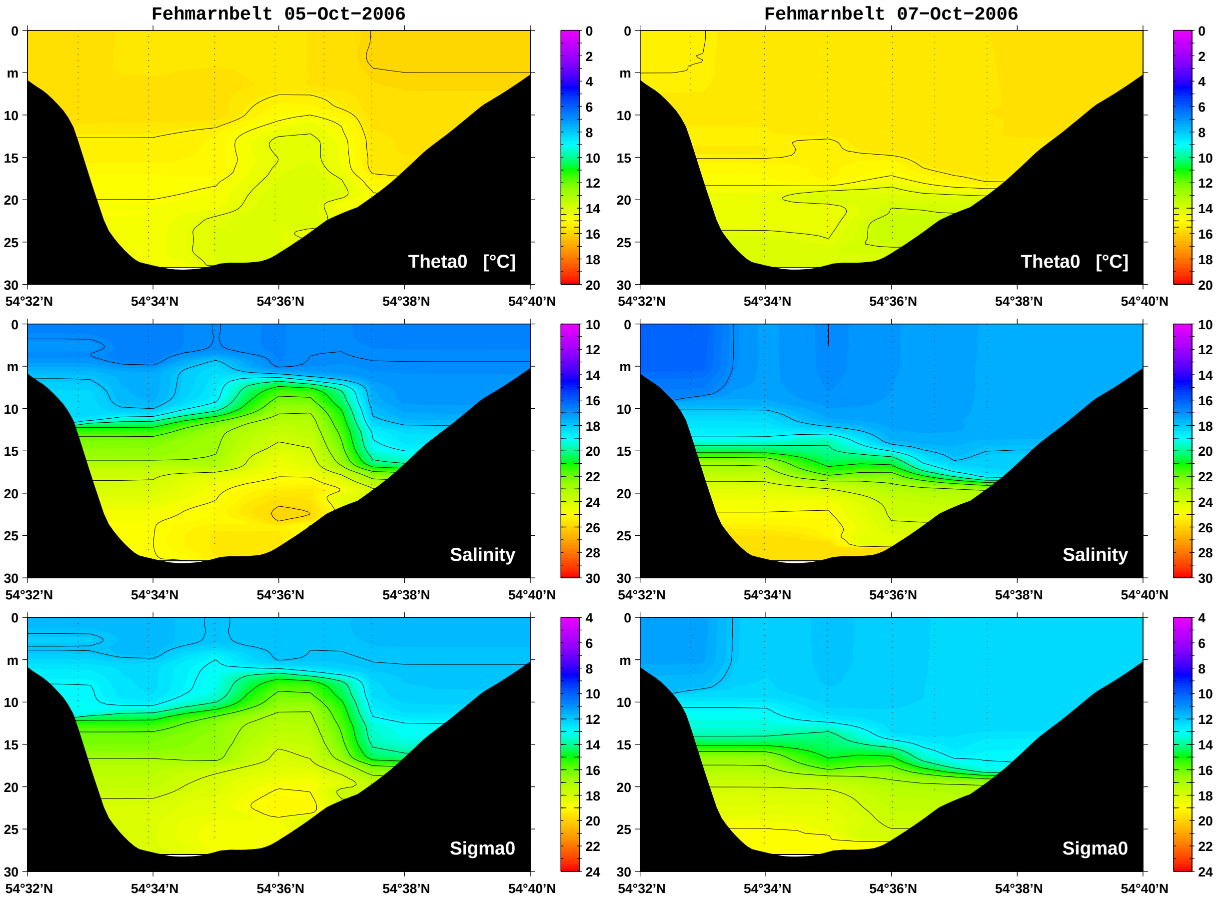

Figure 4.9: Temperature, salinity, and density as measured along the Fehmarn Belt section 05.10.2006 (left) and 07.10.2006 (right).

seen in the temperature distribution too.

The density (figure 4.9, lower) shows a stable distribution with denser water at about 19 $kg\,m^{-3}$ on the ground and less dense water at about 9 $kg\,m^{-3}$ above. It is very similar and consequently determined by the salinity distribution. The south north/slope here is also visible.

The chlorophyll-a concentration (figure 4.9, upper) in the upper five meters is about 1 to 2. In the following five meters it increases to 4.5. This is dependent on temperature, which has the upper limit of its maximum in this layer. Beneath, the chlorophyll-a in the middle of Fehmarnbelt decreases to the ground. In the south there is a decrease across the temperature maximum layer and another maximum in chlorophyll-a beneath it. From thirteen meter depth to the ground there is nearly no chlorophyll-a. In the north, the chlorophyll-a maximum ends at eleven meter depth and at about sixteen meters there again is a slight increase. The increase at depth is approximately due to the vertical mixing associated with a deepening of the mixed layer and nutrient enrichment from the North Sea water core. The upper waters are already depleted. Oxygen is rather similar

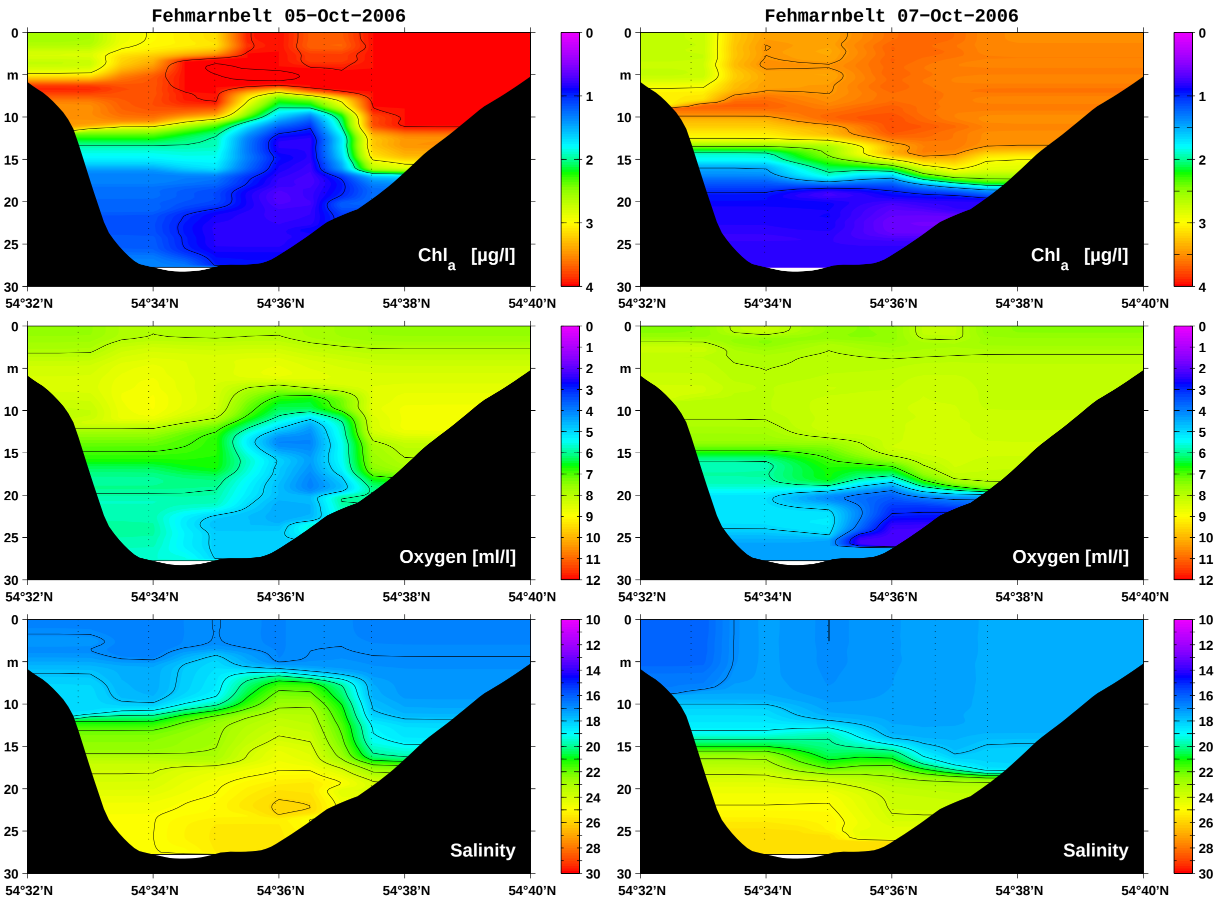

Figure 4.10: Chlorophyll-a, oxygen, and salinity along the Fehmarn Belt section 05.10.2006 (left) and 07.10.2007 (right).

to chlorophyll-a. High oxygen (near saturation is found in the upper layer, lower concentrations in at depth. Note the oxygen sensor was NOT calibrated with discrete samples.

4.3.2 Zonalsection (L section)

In the west of Fehmarnbelt the temperature (figure 4.11, upper) is nearly the same with about 15°C across the whole water column. From Fehmarnbelt (11.2°E) to 12.5°E the temperature decreases eastward and with depth. From 12.5°E to 13.5°E it increases eastward and decreases with depth. At a depth of fourteen meters at 12.7°E there is a minimum in temperature with about 6.5°C. From 13.5°E to 14.3°E the temperature in the upper 18 meters is nearly homogeneous with about 15°C. From 13.5°E to 14°E the temperature decreases from 18 to 32 meters depth to 10.5°C and from there onto the ground there again is an increase of 2°C. From 14°E to 14.3°E the temperature decreases to its minimum with about 5°C at 27 meter depth.

The salinity distribution (figure 4.11, middle) can be subdivided into two sections: western of 12.7°E and eastern of 12.7°E. In the western part at the surface there is a salinity of about 10 to 14 decreasing eastward and across the water column increasing to its maximum at about 23. In the eastern part all the water above 20 meters depth has a very low salinity at about 7. Beneath, it increases slightly to 13 on the ground. The saltier water in the deeper west part has its origin in the north sea. It cannot pass the threshold at 12.5°E.

Density in general is dependent on temperature, salinity and pressure. Here, the density distribution (figure 4.11, lower) is very similar to the distribution of salinity, with its maximum at about $1018\,\mathrm{kg\,m^{-3}}$ and its minimum at about $1005\,\mathrm{kg\,m^{-3}}$. In density there is the answer, why the water of the north sea cannot pass the threshold. It is too dense and with that too heavy.

The subdivision can be used for the chlorophyll-a distribution (figure figure 4.12, upper), too. In the western part there are a few places with rather high chlorophyll-a values up to 5. In the eastern part the chlorophyll-a concentration decreases with depth from 2.5 at the surface to 0.5 on the ground.

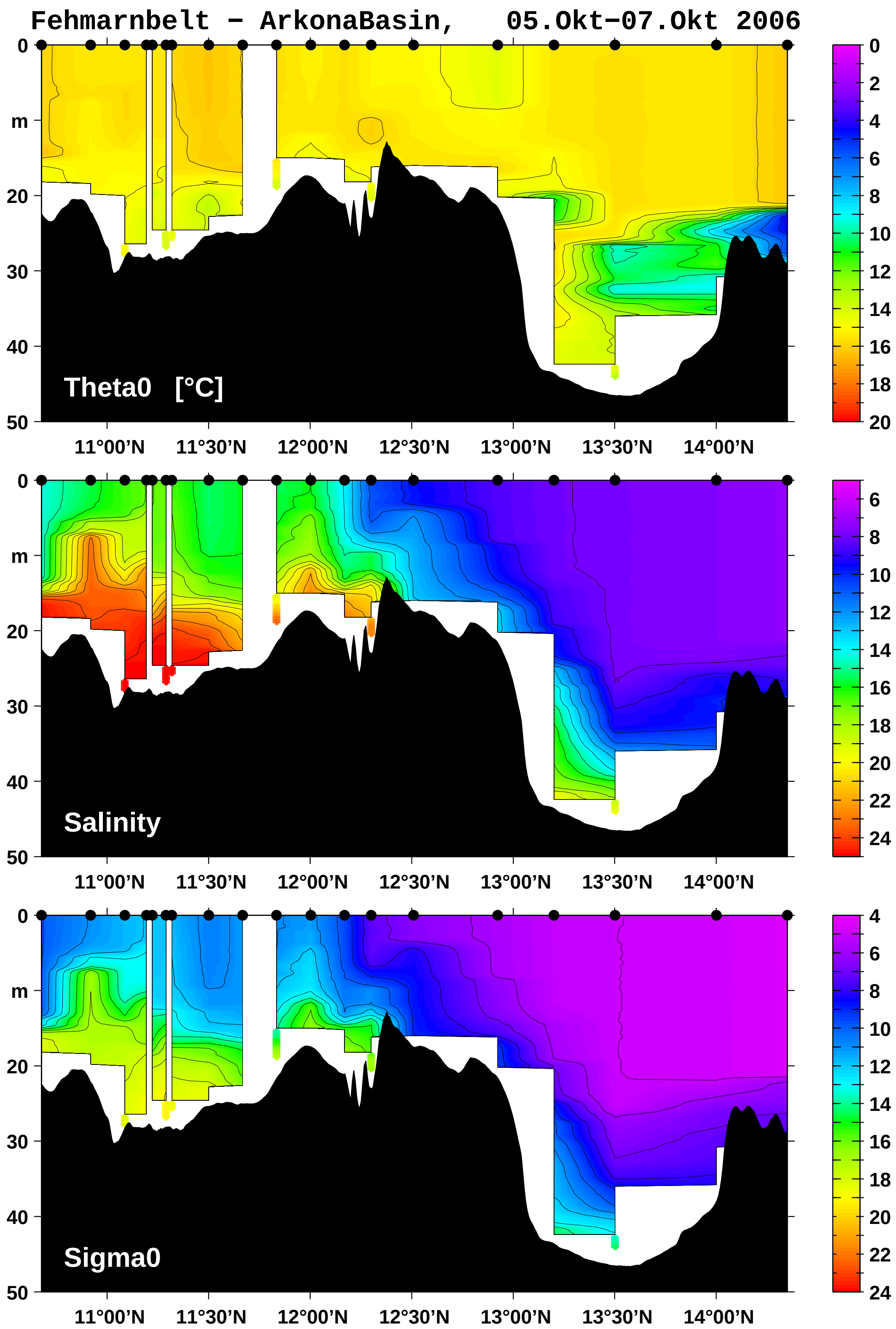

Figure 4.11: Temeprature, salinity, and density as measured along the 'L' section.

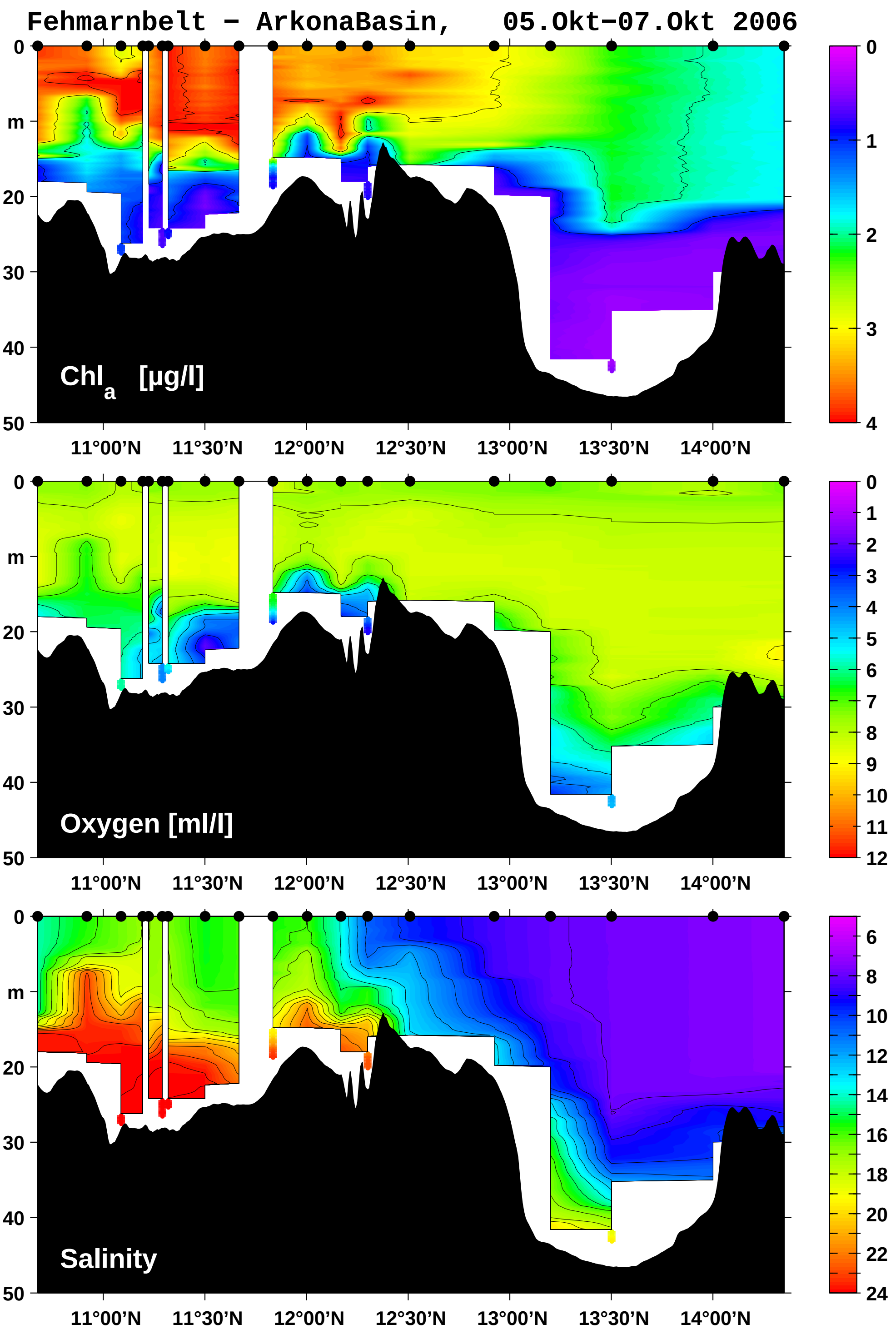

Figure 4.12: Chlorophyll-a, salinity, and density as measured along the 'L' section.

Chapter 5

Equipment/instruments

5.1 Mooring V431

Mooring deployment site V431 is located in the military zone of Marienleuchte at the south-eastern opening of the Fehmarnbelt. Water depth is about 29m. V431 consists of a Workhorse ADCP (300kHz; Serial number 1962) and a self containing T/S recorder of type SBE-MicroCat (serial number 2936). Batteries for the MicroCat, the ADCP and the Benthos releaser have been exchanged. The ADCP was programmed to record every 1800s, the MicroCat every 900s.

Table 5.1: V431: Summary on 14th recovery and 15th deployment of trawl resistant bottom mooring V431.

date; time (UTC)	latitude	longitude	depth	comment
05.10.2006; 15:55				Recovery.
07.10.2006; 06:15	54°31.317'N	11°18.309'E	27.8 m	15th Redeployment.

5.2 CTD/Rosette and Salinometer

5.2.1 CTD

A Hydro-Bios CTD was used during the cruise. Last lab calibration indicate an accuracy of order 0.001 K in temperature. Just before the cruise the oxygen sensor has been lab calibrated at HydroBios.

5.2.2 Beckmann Salinometer

During the cruise water samples have been analyzed for salinity using an inductively working Beckmann salinomter.

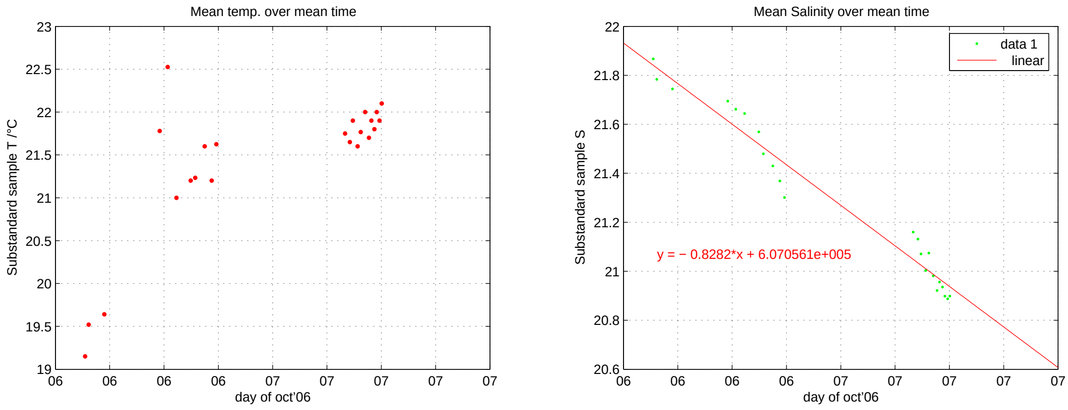

Figure 5.1: Substandard temperature (left) and salinity (right) vs. time

Before analysis could begin the water samples have been stored in the laboratory over night so that they reached room temperature.

To ensure the highest quality of the measurements the salinometer was calibrated against Standard Seawater. A larger sample of Baltic Sea water was afterwards used as a substandard in order to examine the trend (or drift) of the salinometer.

At the beginning of the measurements, water from the substandard was tested until three consequtive measurements showed discrepancies in salinity less than or equal 0.01. This value was then used as a valid substandard salinity.

Seawater samples from three types of instruments have been analysed:

- CTD-bottle samples
- TSG samples
- substandard

From each sample at least two or three measurements were performed until the salinity was measured with a discrepancy less than or equal 0.01. After a few salinity measurements of the samples, a small volume of substandard water was probed with the Beckmann salinometer until the discrepancy was less than or equal 0.01 and so on.

The data was digitally saved on a directly connected laptop and then processed, i.e. data deviating too much within one sample measurement was deleted. Then, the mean values of time, temperature and salinity were calculated for each sample.

Figure 5.1 shows mean temperature and salinity of the substandard samples vs. time, respectively.

Figure 5.2 show the same data vs. mean sequent sample number, respectively.

The maximum salinity was 21.87 from the first substandard sample. It continuously decreased down to 20.89 at one of the last measurements. The mean value for substandard salinity is 21.28±0.34 while the median is 21.16. This clear trend in the Substandard suggests that the

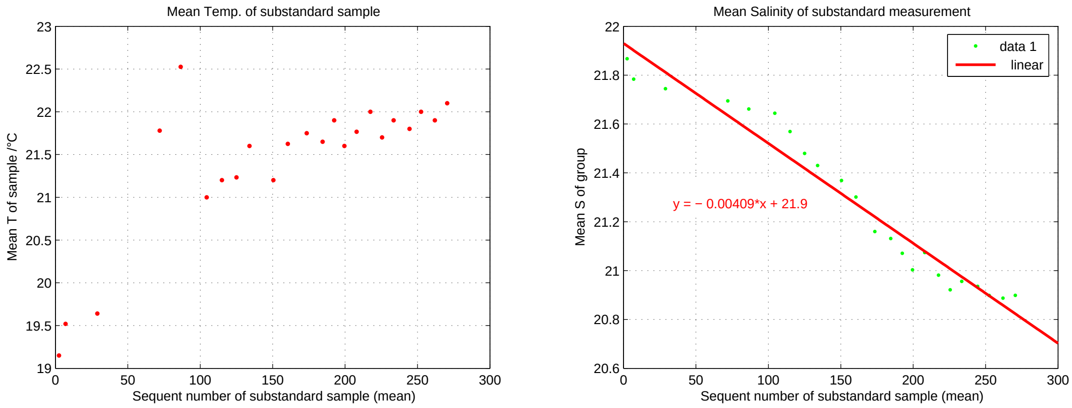

Figure 5.2: Substandard temperature (left) and Salinity (right) vs. sequent sample number

Beckman Salinomter had a problem with stability. This behaviour questions all subsequent measurements.

A linear regression equation is given for both time and sample number dependence (straight lines). It comes out that the salinity is better fitted by a sample number dependent linear equation (heavy line) than by a time dependent equation (normal line). As well, temperature data shows smoother characteristics when plotted against sample number as when plotted against time.

Salinity is highly dependent on the sample's temperature, as can be seen in Figure 5.3. A linear regression reveals

$S(T_{sample}) = -0.26902 \cdot T_{sample} + 27.042$

A 'true' salinity of the substandard water sample is not know. Thus, salinity of other samples can only be calibrated by using the substandard's linear equation given above.

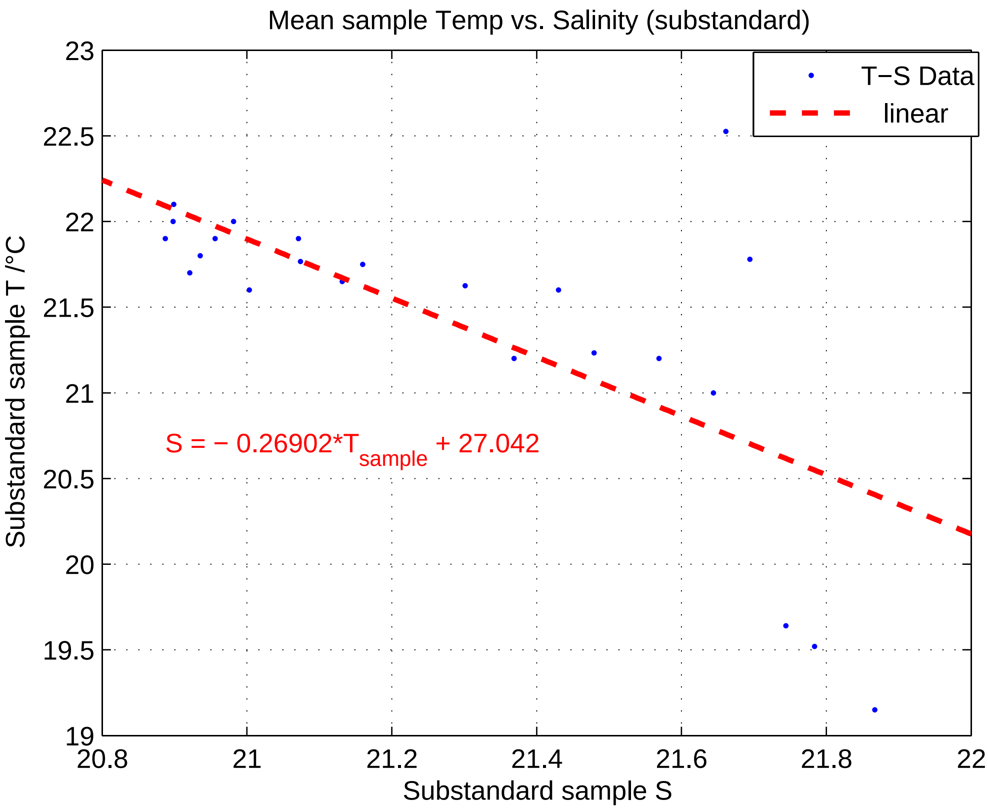

Figure 5.3: Substandard sample salinity vs. temperature

5.3 Underway Measurements

5.3.1 DATADIS

ALKOR has a central data collection system, called DATADIS. Here data from a number of sources (sensors) is merged into a single file which can be used from other devices or/and stored for later processing. The Maritec Engineering DATADIS includes now UTC GPS based time stamps. However, SIMRAD depth soundings are still not available.

In addition one has to remember to take care on saving the data using the DATALOG program on the main PC at the bridge. We had a few stops of the PC system and rebooting the main PC was necessary.

5.3.2 Navigation

ALKOR has a GPS navigational system as well as a gyro compass available. Data is fed into DATADIS and from their available for other devices. For the use with the ADCP system a converter is needed that 'translates' the DATADIS string into a ADCP readable string (for heading only).

Two new monitor in the wet lab and in the dry lab allow to follow the navigation (way point, current position, distance and time to way point, ...) and to see the information embedded into a navigational map. This is a great new feature and very much appreciated.

5.3.3 Meteorological Data

Since March 2006 ALKOR is equipped with a so called automatic weather station which should acquires the basic meteorological parameters (air temperature, wind (speed and direction), wet-temperature, humidity, air-pressure). Shortwave radiation is also recorded. For long wave radiation an EPLAB (Eppley Laboratory, Inc.) Precision Infrared Radiometer (Model PIR) was installed last year - however, this is apparently not available in the D.

There where problems with the wet-temperature measurements or maybe only with the display in the DATADIS system. However, relative humidity may be corrupt...

5.3.4 Echo sounder

The ER 60 SIMRAD echo sounder was activated during the cruise but the data was not stored.

5.3.5 Thermosalinograph

The thermosalinograph (TSG) on ALKOR is permanently installed at about 4m depth and a S/MT 148 type of Salzgitter Elektronik GmbH. TSG data is directly fed into the DATADIS. Calibration was done after the cruise after analysis of bottle samples.

5.3.6 Vessel mounted ADCP

A 300 kHz workhorse ADCP from RD Instruments was mounted in the ships hull. The vmADCP is used with bottom tracking mode. Navigational data comes from the DATADIS system of ALKOR.

Chapter 6

Acknowledgement

Herzlichen Dank an Kapitän Hechler und an die gesamte Besatzung der ALKOR für ihre professionelle Unterstützung und die nette Atmosphäre an Bord.

Chapter 7

Appendix

Station table Station #, Year, Month, Day, Hour, Minute, lat, latmin, long, longmin, depth, Praktikum station #

01	2006	10	05	08	19	54	34.97	10	40.61	21.0	01
02	2006	10	05	09	28	54	36.41	10	55.17	22.2	02
03	2006	10	05	10	24	54	35.42	11	05.23	30.1	03
04	2006	10	05	11	04	54	32.81	11	09.86	10.4	04
05	2006	10	05	11	48	54	33.93	11	11.18	27.6	05
06	2006	10	05	12	15	54	34.98	11	12.50	27.4	06
07	2006	10	05	12	44	54	35.94	11	13.50	27.3	07
08	2006	10	05	13	09	54	36.72	11	14.37	24.9	08
09	2006	10	05	13	38	54	37.47	11	15.45	20.3	09
10	2006	10	05	16	40	54	31.30	11	18.23	27.8	10
11	2006	10	05	17	44	54	27.00	11	30.05	25.6	11
12	2006	10	05	18	51	54	20.98	11	40.08	25.1	12
13	2006	10	06	05	30	54	37.96	14	20.97	31.5	21
14	2006	10	06	07	17	54	47.03	14	00.04	38.9	20
15	2006	10	06	09	40	54	55.02	13	30.08	46.2	19
16	2006	10	06	11	25	54	51.43	13	12.06	43.0	19a
17	2006	10	06	12	56	54	48.76	12	55.39	21.5	18
18	2006	10	06	15	11	54	38.19	12	30.55	17.6	17
19	2006	10	06	16	26	54	32.03	12	18.03	23.0	16
20	2006	10	06	17	52	54	24.01	12	10.15	20.5	15
21	2006	10	06	18	46	54	21.53	12	00.20	17.5	14
22	2006	10	06	19	40	54	21.00	11	50.04	21.7	13
23	2006	10	07	04	18	54	31.36	11	18.35	27.9	10
24	2006	10	07	05	22	54	37.52	11	15.51	20.0	09
25	2006	10	07	05	47	54	36.69	11	14.49	23.6	08
26	2006	10	07	06	08	54	36.02	11	13.55	27.4	07
27	2006	10	07	06	30	54	34.98	11	12.52	27.1	06
28	2006	10	07	06	57	54	33.98	11	11.13	27.0	05
29	2006	10	07	07	22	54	32.81	11	09.79	10.1	04