

## Underway navigation, meteorology and surface hydrography data series for cruise Pelagia PE125 (20 to 29 October 1998)

### Cruise Principal Scientist and Data Originator

Dr. Hans van Haren, Nederlands Instituut voor Onderzoek der Zee (NIOZ), Texel, The Netherlands.

### Content of data series:

Parameter	Unit	Parameter code	Comments
Latitude	deg. N	A	none
Longitude	deg. E	B	none
Ship's Heading	deg.	u	none
Ship's EW velocity	knot	7	computed from lat/lon
Ship's NS velocity	knot	6	computed from lat/lon
Water depth	m	J	none
Sea temperature	deg. C	C	re-calibrated
Salinity	PSU	F	re-calibrated
Chlorophyll fluorescence	$\mu\text{g l}^{-1}$	D	weak signal (not calibrated)
Atmospheric pressure	mbar	z	none
Relative humidity	percent	{	none
Relative wind speed	knots	l	none
Relative wind direction	deg.	m	none
Absolute wind speed	knots	Y	computed
Absolute wind direction	deg.	V	computed
Total solar radiation (#)	$\text{W m}^{-2}$	O	see comments

(#) Data Originator: Slawomir Sagan, Polish Academy of Sciences, Sopot, Poland.

### Sampling strategy

Navigation and meteorological data were recorded for the duration of the cruise from 19 October 1998 23:58 GMT, a few hours after the ship left NIOZ harbour in Texel (Netherlands) until 29 November 1998 20:22, shortly before arriving back in Texel where the cruise ended (Fig. 1).

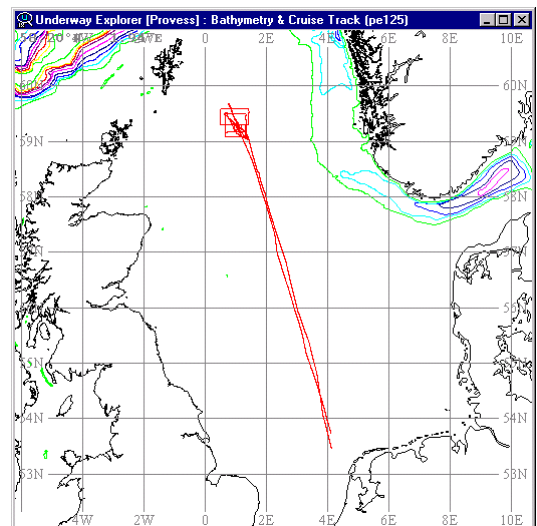


Fig. 1. Cruise track of cruise Pelagia PE125.

### Instrumentation and data processing by originator:

#### Instruments and data acquisition:

The underway data acquisition system was an ABC-system (NERC, Research Vessel Services, UK). It handled the logging and initial data processing from the following instruments:

**BODC Data Documentation**  
**PROVCESS Project MAS3-CT97-015**

- Simrad EK 500 scientific echosounder (depth),
- Chelsea Instruments Aqua flow system (surface seawater fluorescence, temperature and salinity),
- NIOZ PAR system (wind speed and direction from a cup anemometer and windvane both located at a height of 27 metres above sea level, air temperature, relative humidity and barometric pressure),
- Global Positioning System, Gyro compass and EM. Speedlog for navigation data.

The ship's non-toxic intake was at a depth of about 3.5 metres.

Data were supplied to BODC as a series of daily files starting on 20/10/1998 00:00:05 and ending on 29/10/1998 20:24:05 with a 60 second sampling interval. The manufacturer's calibrations had been applied.

Additionally, a Kipp&Zonen pyranometer model CM-5 (data originator: S. Sagan, PAS, Poland) was installed for the cruise duration in an unobscured area of the ship's deck. The instrument was calibrated by the manufacturer.

The instrument specifications were as follows: total solar irradiation: 300-2800 nm, measurement precision: 8%, sensitivity: 9-15 microV/Wm<sup>-2</sup>, impedance: 70-100 Ohm, response time (1/e value): 5 s, 99% value after 55 s, ambient operating temperatures: -40 to +60 deg C, max irradiance: 2000 W/m<sup>2</sup>, cosine response: < ± 7% (percentage deviation from ideal at 10 deg solar elevation on a clear day), azimuth response: < ± 5% (percentage deviation from the mean at 10 deg solar elevation on a clear day), non-linearity: ± 2% (percentage of full scale).

Data from this instrument were supplied to BODC as a series of daily files with a sampling interval of 10 minutes on 21/10/1998 (starting at 10:17) and 1 minute sampling interval on the following days until 27/10/1998 16:06.

### **BODC post-cruise processing and screening**

#### **Reformatting:**

The data were converted to a binary format and merged into one single file for the whole cruise (the 'Binary Merge File') with time as the primary linking key. The time channel of the binary merge file spans from 19/10/1998 23:58:00 to 29/10/1998 20:22:00 with a sampling interval of 60 seconds. In addition the following transformations were made to the data:

- relative wind speed was converted from m/s to knots by multiplying the original values by 1.943845.
- ship's EW and NS velocities were calculated from changes in ship's latitude and longitude with time.
- absolute wind speed and direction were calculated from relative wind speed and direction and ship's EW and NS velocities. They represent the wind at the height of the instrument.

PAS's pyranometer data were then merged into the binary merged file by matching the two time channels.

#### **Screening:**

Each data channel was inspected on a graphics workstation. If present, spikes and periods of dubious data were flagged. Data values were not edited or deleted but flagging was achieved by modification of the associated quality control flag.

#### **Data processing, correction and calibration procedures:**

- Time: two minutes were subtracted from the time channel of the underway data after a constant offset was noticed between the navigation channels of the underway acquisition system and the navigation channels of the SeaSoar data acquisition system deployed during the cruise.
- Temperature and salinity: both the underway sea surface temperature (SST) and salinity (SAL) channels were checked against surface values extracted from calibrated CTD profiles and averaged between 2 and 5 db (excluding data points which had been flagged). For salinity, an additional series of 12 bottle salinity samples were available for comparison. These samples were obtained from the ship's non-toxic supply (Dave Teare, RVS) for the calibration of the RVS SeaSoar salinity and analysed on a Guildline Autosol bench salinometer calibrated against OSI standard seawater. Significant differences were found between the underway data and the CTD or salinometer data, and algorithms were derived to correct the underway data.

The best fit for temperature was obtained using a linear drift model described by the following equation:

$$\text{SST}_{\text{cal}} = \text{SST} + (-6.10^{-6} \times \text{cycle\_number}) - 0.0695, \quad R^2=0.525, \quad n=41$$

Salinity exhibited a constant positive offset from the CTD data which was corrected for by applying the following calibration:

$$\text{SAL}_{\text{cal}} = \text{SAL} - 0.027 \quad (\text{standard deviation: } \pm 0.006, n=41)$$

The calibration data were then checked against the 12 surface bottle salinity measurements. The difference between the two was not significant indicating that no further calibration was necessary.

### **Comments on data quality**

- Total solar radiation: measurement precision under the conditions of low solar radiation level (<100 W m<sup>-2</sup>) or low solar altitude (h < 20 degrees) may be lower than given in the instrument specification quoted above (both occurred during the cruise duration).
- Fluorescence: an attempt was made to calibrate the surface underway raw fluorescence record against extracted chlorophyll *a* measurements and surface chlorophyll concentration extracted from the calibrated CTD fluorescence channel. However, variations in the surface underway fluorescence signal were very small and were dominated by background noise. This signal was compared with both extracted chlorophyll concentrations from surface water samples (sampled from the non-toxic supply or from CTD-rosette sampling above 5 m) and chlorophyll concentration obtained from the calibrated CTD fluorometer. The underway fluorescence signal (range: 0.14-0.22 µg l<sup>-1</sup>) exhibited no obvious relationship with chlorophyll concentration measured on the extracted samples (average ±SD: 0.82 ±0.19 µg l<sup>-1</sup>, range: 0.39-1.10, n=23) or those obtained from the calibrated CTD fluorometer (average ±SD: 0.76 ±0.21 µg l<sup>-1</sup>, range: 0.35-1.23, n=40) and no calibration was applied. Although such low fluorescence signal might reflect low chlorophyll surface gradients, users are advised to use these data with caution since it could also be the result of a low instrument sensitivity caused by malfunction or dirty optics.