Sensor Information
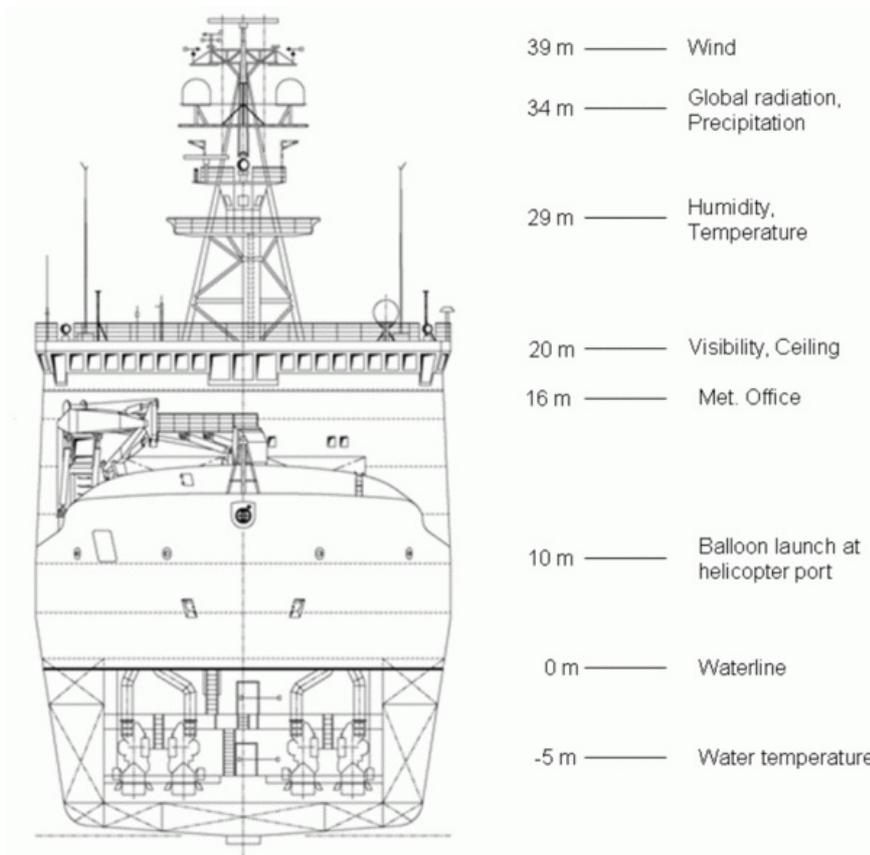

Heights of the meteorological sensors

Timing

The time information, offered in all files listed in http://www.pangaea.de/search?q=PSuwMet10min, represents the center of the 10-minute statistic interval. Please keep in mind, that all instantaneous values are normally taken about 5 minutes later.

Wind

The relative wind direction (with respect to the ships heading) and wind speed (with respect to the ship) are measured at a height of 39m above sea level at the port and starboard side of the ship. Only the windward sensor gets registered. The (true) wind direction and the (true) wind speed was calculated from the relative wind using the ships speed relative to the water (ATLAS, DOLOG 22) and the giro heading. From 1998-10-15 on - after GPS came in use - the true winds are calculated with respect to the ships movement over ground and the ships heading from GPS in addition to the giro heading.

From the beginning on heated cup anemometers (SK 565, Thies, Germany) and wind vanes (SK 566, Thies, Germany) have been in use. They got replaced in October 2007 by ultrasonic anemometers (Sonic 2Da, Thies, Germany).

Temperature

The air temperatures are measured at a height of 29 m above the waterline. Till 2002-06-25 the measurements were performed with PT100 mounted in radiation shield not ventilated artificially. Afterwards, combined humidity and temperature transmitter (HMP 233, Vaisala, Finland) – also mounted in not ventilated radiation shields - are used.

Humidity

Air humidity data are obtained at a height of 29 m above the waterline. A hair hygrometer (portside, 1.10000.01.48, Thies, Germany) and a dew point sensor (starboard, 3100.0000 BG, Friedrichs, Germany) were used. The accuracy of both instruments was rather limited. Differences in the derived relative humidity of more than 10% were frequent. When the reason for these differences could not be detected, both values were excluded from the datasets and the 3-hourly routine surface observations were performed by using a hand held psychrometer after Assmann. When the difference between both instruments were lower than 10% the average of both values were registered. At 2001-07-11 the dew point sensor was replaced by a combined humidity and temperature transmitter (HMP 233, Vaisala, Finland). At 2002-06-25 also the hair hygrometer got replaced by

a HMP 233 sensor mounted in not ventilated radiation shields. The accuracy of these sensors can be taken to be better than 5% relative humidity in most cases. Only the windward sensor gets registered.

Surface air pressure

The air pressure is measured with an electronic barometer (SETRA B270, Friedrichs, Germany). Although the air pressure is measured inside the meteorological office at a height of 16 m the measurements are reduced to sea level. To avoid the influence of pressure fluctuations within the meteorological office due to air conditioning etc. the inlet of the pressure sensor is connected to a pipe leading to the outside close to the craws nest. The end of this pipe is a pressure labyrinth to reduce wind induced pressure fluctuations. Nevertheless, strong winds still influence the air pressure measurements up to 1 hPa. From 1993-05-18 to 1994-10-06 the surface pressure was sampled in hPa once a minute and stored only as integer. Thus, the 10-minute averages - taken during this time - have a rather low resolution.

Precipitation

Precipitation measurements on board of Polarstern started at 1994-10-18 (DOSA 450, Friedrichs, Germany). The sensor is unable to measure solid precipitation. Only rain events are quantified. Due to several problems with the sensor, the data should be taken with care. Data which are obviously wrong are already excluded from the datasets. Nevertheless, it is still possible that some rain events are missing, that extreme sea spray affects the measurements and that accumulated snow melts within the sensor and gets measured as liquid precipitation hours or days after the snowfall.

Global Radiation

Global ratiation is measured by using an artificially ventilated pyanometer. A description of the instrument can be found at www.kippzonen.com/product/cm11.html. The instrument is placed at the level of the craw`s nest, a position, not totally free of cast shadow problems. Nighttime values are normally not set to zero. They vary +/-0 and can be used to quantify offsets of the instruments which also occur during daytime. Especially the older data are subject of rather huge offset problems and have to be taken with care.

Cloud height

Till 2011-10-25 the colud height was measured using the cloud ceilometer LD-WHX05 (Impulsphysik, Germany) with a maximum range of 12,000 feet. The value 20,000 denotes clear sky above the vertically pointing instrument. After 2011-10-25 the ceilometer CL51 (Vaisala, Finland) with a range up to 43,000 feet was used and the clear sky value was changed to 50,000.

The following *.cgn file was used to retrieve the data:

```
(TSB = ThermoSalinograph Bow, TSK = ThermoSalinograph Keel)
 POLDAT Configuration File: PDDB4.MIW 26-JAN-1995 14:31
 Start of Computation ............: 01-JUN-1994 00:00
 End of Computation ..............: 04-JUN-1994 00:00
 Length of Statistic Interval ....: 10 min 0 sec
 Output File Format ..............: VMS
 Output-Format of Time ...........: YY MM DD hh mm
 Output-Format of Position .......: degree(decimal) sign
 Output-Format ID (internal)......: 1211
 SNo Format v m - + s n d.d<< Value Sensor Error >>v m - + s n d.d
 3 num * 3.2 TSB temperature 2 3.2
 4 num * 2.2 TSB conductivity 2.2
 5 num * 2.2 TSB salinity 2.2
 7 num * 3.1 air temperature luv 3.1
 8 num * 4.0 rel. humidity 4.0
 9 num * 3.1 dewpoint 3.1
 10 num * 4.1 air pressure 4.1
 11 num * 4.1 rel. wind velocity luv 4.1
 12 num * 4.0 rel. wind direction luv 4.0
 14 num * 4.0 global radiation 4.0
 15 num * 5.0 visibility 5.0
 16 num * 5.0 ceiling 5.0
 17 num * 4.0 true wind direction 4.0
 18 num * 4.1 true wind velocity 4.1
 45 num * 4.1 gyro heading 4.1
 60 pos * 1.4 system position lat 4.1
 61 pos * 1.4 system position lon 4.1
 68 num * 5.1 system depth 5.1
 80 num * 3.1 filter course made good 3.1
 81 num * 3.1 filter speed made good 3.1
 108 num * 3.2 TSK temperature 2 3.2
 109 num * 2.2 TSK conductivity 2.2
 110 num * 2.2 TSK salinity 2.2
 112 num * 3.2 ozone concentration 3.2
 119 num * 4.1 max rel. wind veloc. last min 4.1
 120 num * * 3.4 precipitation 3.4
```

Frequently, averaged values (m), as offered by DSHIP, were taken. The visibilities and cloud ceilings base on minimum values (-), the max rel. wind veloc. last min on maximum values (+), while all navigation data are taken from the last valid (v) instantaneous data within the statistic intervals. To

calculate the precipitation the averages (m) and numbers of events (n) were retrieved.

HELMHOLTZ