Polarstern Poldat-AWS Data Quality Control Report

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Introduction:

This report summarizes the quality of surface meteorological data collected by the Polarstern (identifier: DBLK) Poldat-automated weather system during WOCE cruises AR_15_/15 and S__04A/02. The data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by G. Koenig-Langlo at AWI-Bremerhaven, Germany. There they were converted to standard DAC netCDF format. The data were then processed using an automated screening program which adds quality control flags to the data, highlighting potential problems. Finally, the Data Quality Evaluator reviews the data and pre-processor flags. Flags are then added, modified, and deleted according to the judgement of the Data Quality Evaluator and other DAC personnel. An in depth description of the WOCE quality control procedures can be found in Smith et al. (1996). The data quality control report summarizes all flags for the Polarstern AWS data and explains reasons why these flags were assigned.

Statistical Information:

The Polarstern data were expected to include observations averaged every 10 minutes on each of the WOCE cruises. Values for the following variables were collected:

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Platform Heading	(PL_HD)
Platform Course	(PL_CRS)
Platform Speed	(PL_SPD)
Ocean Relative Wind Direction	(DIR)
Ocean Relative Wind Speed	(SPD)
Sea Temperature	(TS)
Atmospheric Pressure	(P)
Air Temperature	(T)
Dewpoint Temperature	(TD)
Relative Humidity	(RH)
Specific Humidity	(Q)

Rain Rate	(RRATE)
Atmospheric Radiation	(RAD)*
Cloud Base Height	(ZCL)**

* Provided to DAC only on cruise S__04A/02
** Verified only for correct WMO coding

Details of each cruise including cruise dates, number of records, number of values, number of flags, and percentage flagged are listed in Table 1. A total of 229,573 values were evaluated with 5,652 flags added by the preprocessor and Data Quality Evaluator for a total of 2.46 percent of the values being flagged.

Table 1: Statistical Cruise Information\

CTC	Dates	Number of Records	Number of Values	Number of Flags	Percentage Flagged
AR_15_/15	10/18/94 - 11/22/94	5,179	77,685	284	0.34
S__04A/02	03/17/96 - 05/20/96	9,493	151,888	5,372	3.54

Summary:

The AWS data from the research vessel Polarstern are excellent in quality. Only two major problems were found by the analyst. One is the significant number of missing values that occur in PL_HD and especially in PL_CRS. The other is a problem of recurring negative values for RAD during nighttime hours. Otherwise, the flags assigned by the prescreener do not represent any major errors in the data. The Data Quality Evaluator assigned few additional flags. Table 2 details the distribution of flags among the different variables. Also, a thorough discussion of the flags is given below.

Ocean Relative Winds

The preprocessing program computes earth relative winds using the platform relative winds along with platform heading, course, and speed. The computed winds are then compared to the ocean relative winds reported by the research vessel. The program then assigns an “E” flag when the DIR does not match within plus or minus 10 degrees and if SPD does not match within plus or minus 5 m/s. DIR received 545 "E" flags from this test while SPD received 11 "E" flags. For this data set the test does not ensure that either set of winds is correct if unflagged or in error if flagged, but instead calls attention to times when the ocean relative winds differ significantly from earth relative winds.

Radiation

The prescreener assigned 3,058 "B" flags to RAD data for negative values. These negative values occurred during nightime hours. Since RAD is a measure of incoming shortwave radiation, these negative values are physically meaningless.

Table 2: Number of Flags and Percentage Flagged by Variable

Variable	B	E	G	S	Total Number of Flags	Percentage of Variable Flagged
PL_SPD	1			2	3	0.02
DIR		545		2	547	3.73
SPD		11	149	2	162	1.09
TS			936		936	6.38
P			577		577	3.93
T			348		348	2.37
RH			24	1	25	0.17
RAD	3,058				3,058	32.21
Total number of Flags	3,059	556	2,034	7	5,656	2.46
Percentage of All Values Flagged	1.33	0.24	0.87	0.00	2.46	

Climatology

The prescreener also compares the values of SPD, TS, P, T, and RH to a climatology (da Silva et al. 1994) and assigns the "G" flag for values outside of four standard deviations from the mean.

Much of the time the research vessel was located near Antarctica, an area characterized by highly variable weather and a questionable climatology. Consequently, many “G” flags were given to SPD, TS, P, T, and RH. In all cases, the analyst believes that the data represent accurate values. The “G” flags were left simply to call attention to relatively extreme events.

Other Flags

The analyst applied seven “S” flags to isolated spikes in the data. PL_SPD received one “B” flag from the prescreener for a unrealistic value greater than 15 m/s.

Final Comments:

The AWS data from the research vessel Polarstern is in excellent condition. Aside from missing values, the user should have no problems with the data

Appendix A: Modifications to DBLK AWS Data

Original cloud heights were measured with a ceilometer. Cloud heights in meters were converted to standard WMO cloud height codes (Smith and Legler, 1996). Original ceiliometer data can be provided upon request.

References:

Smith, S. R., C. Harvey, and D. M. Legler, 1996: *Handbook of Quality Control Procedures and Methods for Surface Meteorology Data.* WOCE Report No. 141/96, Report WOCEMET 96-1, Center for Ocean Atmospheric Prediction Studies, Florida State University, Tallahassee, FL 32301

Smith, S. R. And D. M. Legler, 1996: *netCDF Code Manual for Quality Controlled Surface Meteorological Data.* Report WOCEMET 95-4, Center for Ocean Atmospheric Prediction Studies, Florida State University, Tallahassee, FL 32301

da Silva, A. M., C. C. Young and S. Levitus, 1994: *Atlas of Surface Marine Data 1994, Volume 1: Algorithms and Procedures.* NOAA Atlas Series. In preparation.