Marion Dufresne AWS Data Quality Control Report

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July 14, 1997

Report WOCEMET 97-17

Version 1.0

Introduction:

This report summarizes the quality of surface meteorological data collected by the Marion Dufresne (identifier: FNGB) automated weather system during four WOCE cruises. The data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by M. Fieux. 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 current 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 Marion Dufresne AWS data and explains reasons why these flags were assigned.

Statistical Information:

The Marion Dufresne AWS data are expected to include observations taken every hour on each of the WOCE cruises. Values for the following variables were collected:

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Earth Relative Wind Direction	(DIR)
Earth Relative Wind Speed	(SPD)
Atmospheric Pressure	(P)
Air Temperature	(T)
Wetbulb Temperature	(TW)
Sea Temperature	(TS)*

* Provided to DAC only on cruises ISS01_/02 and I__06S/00.

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 27,615 values are evaluated with 411 flags added by the preprocessor and Data Quality Evaluator for a total of 1.49 percent of the values being flagged.

Table 1: Statistical Cruise Information

CTC	Dates	Number of Records	Number of Values	Number of Flags	Percentage Flagged
IR__06_/01	07/30/89 - 08/08/89	811	6,488	56	0.86
ISS01_/02	04/04/91 - 05/19/91	907	8,163	115	1.41
IR_06_/02	02/02/92 - 03/22/92	563	4,504	134	3.02
I__06S/00	02/02/93 - 03/18/93	940	8,460	106	1.25

Summary:

The AWS data from the Marion Dufresne are in good condition except for the variables T and TW, which had a major conflict. SPD, T, and TS have 75 values which lie outside of plus or minus four standard deviations from a climatology, but in all cases the evaluator believes the data represent realistic values. The other variables had only isolated problems. Table 2 details all flags that were assigned to each variable and a thorough discussion of the flags immediately follows.

Table 2: Number of Flags and Percentage Flagged by Variable

Variable	D	F	G	I	K	S	T	Total Number of Flags	Percentage of Variable Flagged
TIME							2	2	0.06
LAT		1						1	0.03
LON		1				2		3	0.09
DIR					51			51	1.58
SPD			9	2	51			62	1.92
P				6		2		8	0.25
T	107		36			1		144	4.47
TW	107					1		108	3.35
TS			30			2		32	1.73
Total number of Flags	214	2	75	8	102	8	2	411	1.49
Percentage of All Values Flagged	0.77	0.01	0.27	0.03	0.37	0.03	0.01	1.49	

TW greater than T

The prescreener performs a multivariate check to determine if the reported wet-bulb temperature is greater than the reported air temperature, a physical impossibility. When TW is greater than T, a "D" flag is assigned to both the T and TW values. The variables failed this test 107 times and were flagged appropriately. The time series for both air temperature and wet-bulb temperature are fairly rough, with small positive and negative spikes of up to 3 degrees C. Inaccuracies in the measurement of T and TW are likely the cause of these spikes and a fraction of the noise in the time series. These inaccuracies would also cause the intermittent failure of the multivariate test. However, at the one hour time step it is impossible to know which values are unrealistic. Both data sets should be used with caution, particularly when flagged with a "D".

Climatology

The prescreener compares the values of SPD, TS, P, and T to a climatology (da Silva et al. 1994) and assigns the "G" flag for values outside of four standard deviations from the mean. SPD, T, and TS all received "G" flags. The flagged T and TS data were gathered when the research vessel was located near the coast of Antarctica, an area of highly variable weather and a questionable climatology. Eight of the flagged SPD values occurred during a period of very low surface pressure on cruise IR_06_/02 while another corresponded to what appears to be and isolated local storm on cruise IR_06_/01. In all cases, the analyst believes that the data represent accurate values. The "G" flags were left in place simply to call attention to relatively extreme events.

Navigation Data

LAT and LON were assigned 2 pairs of "F" flags at isolated times for unrealistic ship movement.

Wind Data

On the second half of cruise IR_06_/02 both DIR and SPD had many zero values, running for 23 consecutive hours at one point. So many periods of zero wind seem unrealistic when compared to climatology. Consequently, all zero values for SPD and DIR were flagged with a "K" during this half of the cruise and should be used with caution.

Interesting Feature

On 2/27/92 and 2/28/92 of cruise IR_06_/02 the surface pressure dropped below 995 mb and the wind speed rose to a high of 30 m/s. These data likely reflect the passage of a tropical cyclone, and the extreme values of P and SPD were flagged with an "I" to highlight these interesting features.

Spikes

LON, P, T, TW, and TS all received "S" flags for isolated spikes in the time series. Such spikes are not unusual in electronically gathered data.

Final Comments:

The navigation, pressure, sea temperature, and most of the wind data from the Marion Dufresne appear to be very reliable and should present no problems for the user. Air temperature and wetbulb temperature have an apparent conflict and both should be used with caution. Some of the wind data on the second half of cruise IR_06_/02 is also of questionable quality.

References:

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.

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