Discovery Multimet Data Quality Control Report

Jesse Enloe, Daniel M. Gilmore, and Shawn R. Smith

World Ocean Circulation Experiment

Surface Meteorological Data Assembly Center

Center for Ocean Atmospheric Prediction Studies

Florida State University

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Introduction:

This report summarizes the quality of surface meteorological data collected by the research vessel *Discovery* (identifier: GLNE) Multilmet automated data collection system during one WOCE cruise beginning 11 November 1992 and ending 14 December 1992. The pre-quality controlled data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by D. Turner of the British Oceanographic Data Center (BODC) and were converted to standard DAC netCDF format. The data are then processed using an automated screening program, which adds quality control flags to the data, highlighting potential problems. Finally, the Data Quality Evaluator (DQE) reviews the data and current flags, whereby flags are added, removed, or modified according to the judgement of the DQE and other DAC personnel. Details of the WOCE quality control procedures can be found in Smith et al. (1996). The data quality control report summarizes the flags for the *Discovery* Multilmet data, including those added by the BODC, the preprocessor, and the DQE.

Statistical Information:

The *Discovery* Multilmet data are expected to include observations taken every minute for the following variables:

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Earth Relative Wind Direction	(DIR)
Earth Relative Wind Speed	(SPD)
Sea Temperature	(TS)
Atmospheric Pressure	(P)
Port Air Temperature	(T)
Starboard Air Temperature	(T2)
Port Wet Bulb Temperature	(TW)
Starboard Wet Bulb Temperature	(TW2)
Downwelling Longwave Radiation	(RAD)
Photosynthetically Available Radiation	(RAD2)
Downwelling Shortwave Radiation	(RAD3)

Details of the cruise are listed in Table 1 and include cruise dates, number of records, number of values, number of flags, and total percentage of data flagged. A total of 675,360 values are evaluated with 200,692 flags added by the BODC, the preprocessor, and the DQE resulting in a total of 29.72% of the values being flagged.

Table 1: Statistical Cruise Information

CTC	Dates	Number of Records	Number of Values	Number of Flags	Number Flagged
SR_01_/02; P__19_/02; PR_30_/02	11/11/92 - 12/14/92	48,240	675,360	200,692	29.72

Summary:

The Multimet data from the *Discovery* proved to be of very poor quality. The distribution of flags for each variable is detailed in Table 2. The BODC Q-flag was assessed by the BODC to any data that was thought to be questionable by the BODC.

Table 2: Number of Flags and Percentage Flagged for Each Variable

Variable	B	D	G	K	L	Q	S	Total Number of Flags	Percentage of Variable Flagged
TIME								0	0.00
LAT					14			14	0.03
LON					14			14	0.03
DIR				126		92	72	290	0.60
SPD				12		928	1	941	1.95
TS	17,588		491					18,079	37.48
P						29		29	0.06
T		648		45,863		6	65	46,582	96.56
T2		39,731	290			245	7	40,273	83.48
TW		44,996				1		44,997	93.28
TW2		39,738						39,738	82.38
RAD							3	3	0.01
RAD2	9,732							9,732	20.17
RAD3								0	0.00
Total Number of Flags	27,320	125,113	781	46,001	28	1301	148	200,692	
Percentage of All Variables Flagged	4.05	18.53	0.12	6.81	0.00*	0.19	0.02	29.72	

*Percentage < 0.01

B-Flags:
During this cruise the vessel traversed into the extremely cold waters of the Antarctic Circle. Due to the high salinity of the ocean in that region due to brine rejection, it is possible for the sea temperature to actually fall a few degrees below freezing without solidifying. These negative sea temperature values, though realistic at only a degree or so below freezing received the B-flag.

There were 9,732 B-flags assessed to RAD2 by the preprocessor throughout the cruise, representing radiation values less than 0 W/m^2. These physically unrealistic negative radiation values are likely the result of the instrument not being tuned to low radiation values.

D-Flags:
A total of 125,113 D-flags were assessed to the port and starboard air temperature and wet bulb temperature for failing the $T \geq TW$ test. The wet bulb and air temperatures for these periods were recording very similar values, which would indicate that the reservoir for the psychrometer had run dry.

G-Flags:
The G-Flags assessed to the data by the preprocessor highlight values that are greater than four standard deviations from the climatological mean (da Silva et al. 1994). The G-flag is only found on sea temperature and air temperature in this data set. On this cruise, the vessel traversed the Southern Pacific, south of the 40º south latitude line. In this region of the globe, little is known of the climatology, as the data is sparse. Consequently, though extreme observations, the G-flagged values are likely to be realistic.

The K Flag:
The 45,863 K-flags that were applied to port air temperature are a result of extremely noisy data. The data noise was too variable to be considered realistic and too extensive to use the spike flag (S). Therefore the suspect data was assessed the cautionary K-flag.

There were 12 K-flags applied to SPD on 23 November 1992. In a matter of one minute the earth relative wind speed value went from ~4m/s to ~17m/s. The following 12 minutes were flagged "K" as the data slowly returned to its original trend. A similar incident occurred with DIR on 30 November 1992, earning it 9 K-flags. The remaining 115 K-flags assessed to the DIR data was due to very large shifts in the wind direction thought to be suspect by the DQE.

The L Flag:
While still close to port at the beginning of the cruise, the ship was too close to land for it position to be resolved in the land mask used by the preprocessor; thus, LAT and LON were assessed 14L-flags a piece. The L-flag is to bring attention to a position value over land.

The Q Flag:
The *Discovery* Multimet data came to the DAC already quality controlled by the BODC. The BODC suspect data flag was converted to a Q-flag (questionable) under our flagging system. The Q-flag was assessed to data the BODC found to be suspect.

Spikes:
Isolated spikes occurred in most of the variables throughout the data. Spikes are a relatively common occurrence with automated data, caused by various factors (e.g. electrical interference, ship movement). These individual points were assigned the S-flag.

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 32306-2840

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.