James Clark Ross Multimet Data Quality Control Report

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Introduction:

This report summarizes the quality of surface meteorological data collected by the research vessel *James Clark Ross* (identifier: ZDLP) Multimet automated data collection system during one WOCE cruise beginning 20 March 1995 and ending 6 May 1995. The pre-quality controlled data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by D. Martin Gould of the British Oceanographic Data Center (BODC) and were converted to standard DAC netCDF format. The data were then processed using an automated screening program, which added quality control flags to the data, highlighting potential problems. Finally, the Data Quality Evaluator (DQE) reviewed the data and current flags, whereby flags were 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 *James Clark Ross* Multimet data, including those added by the BODC, the preprocessor, and the DQE.

Statistical Information:

The *James Clark Ross* Multimet data include observations taken every minute for the following variables:

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Sea Temperature	(TS)
Downwelling Longwave Radiation	(RAD)
Downwelling Shortwave Radiation	(RAD2)
Photosynthetically Available 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 478,800 values were evaluated with 10,327 flags added by the BODC, the preprocessor, and the DQE resulting in a total of 2.16% of the values being flagged.

Table 1: Statistical Cruise Information

CTC	Dates	Number of Records	Number of Values	Number of Flags	Percent Flagged
AR_23_/00	03/20/95 – 05/06/95	68,400	478,800	10,327	2.16

Summary:

The overall quality of the Multimet data from the *James Clark Ross* was excellent except for the sea temperature (TS) variable. The distribution of flags for each variable is detailed in Table 2.

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

Variable	B	G	K	Q	S	Total Number of Flags	Percentage of Variable Flagged
TIME						0	0.00
LAT						0	0.00
LON						0	0.00
TS		1635		7494	9	9138	13.36
RAD	20			18		38	0.06
RAD2	64					64	0.09
RAD3			1085	2		1087	1.59
Total Number of Flags	84	1635	1085	7514	9	10327	
Percentage of All Values Flagged	0.02	0.34	0.23	1.57	0.00*	2.16	

*Percentage<0.01

The Q Flag:
The *J.C. Ross* Multimet data were quality controlled by the BODC prior to arrival at the DAC. The *Q* flag denotes values that were deemed suspect by the BODC.

Missing Data:
The J.C. Ross cruise began on March 20 with all variables missing until 1221Z on March 21. The majority of missing data during the cruise was associated with the downwelling shortwave radiation (RAD2) variable with numerous missing values reported during overnight hours. All other variables contained sporadic missing data values.

Sea Temperature:
On March 21, the sea temperature sensor reported suspect data and were flagged *Q* from 1221Z to 1242Z. The BODC also identified numerous ice blockage problems where the temperature suddenly rose approximately five to ten degrees Celsius, then rapidly returned to the previous temperature trend. The erroneous values were assigned the *Q* flag. This problem was most apparent from March 27 through April 8 when the J.C. Ross was generally south of 57ºS latitude. In addition, the *G* flag was assigned by the preprocessor to sea temperature values greater than four standard deviations from the climatological mean (da Silva et al. 1994). The climatology in the Antarctic region is questionable and the data flagged *G* appear to be valid.

Shortwave Radiation:
The downwelling shortwave radiation (RAD2) data were measured by two sensors situated on the foremast. In order to reduce the effects of shadows on the sensors the maximum values from each of the two shortwave sensors were included in the data set. The "PAR" or photosynthetically available radiation (RAD3) data were measured by a single sensor on the foremast. With PAR data available from only one sensor, it was determined that shading effects on the sensor reduced some of the data values. As a result, the DQE flagged the suspect PAR values with the *K* flag. This phenomenon is most apparent between the hours of 1000Z and 1400Z and also 1630Z and 1900Z where the PAR values rapidly drop off while the shortwave radiation values remain near steady.

Values outside of realistic range:
The *B* Flag was assigned by the preprocessor to downwelling longwave (RAD) and shortwave radiation (RAD2) values outside of realistic range, either below zero Watts per meter squared or above 1400 Watts per meter squared.

Data spikes:
The majority of the data spikes were assigned the *Q* flag by the BODC. However, additional spikes were noted by the DQE and assigned the *S* flag. Spikes are common to electronic data and may be associated with power surges or ship movement.

Final Comments:
The overall quality of the data was excellent with the exception of the sea temperature data. The seawater intake to the thermosalinograph experienced numerous ice blockage problems as noted by the BODC. One other notable problem concerns the "PAR" or photosynthetically available radiation (RAD3) data where the PAR sensor was determined to be in shadow during portions of the cruise.

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.