Heincke AWS Quality Control Report

Cruises: AR_16_/01
AR_16_/02
AR_16_/03
AR_16_/06
AR_16_/08

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Addendum:

Member's of the WOCE Hydrographic Project Office (WHPO) and WOCEMET met at the 13th Data Products Committee (DPC) meeting in College Station, TX to discuss reconciliation of the WOCE cruise line designators. This was done in anticipation of the future release of version 3 of the WOCE global data set, and resulted in changes to several WOCE cruise line designations.

During the mass update of the WOCE designators, it was determined by the WOCE Data Center that the two Heinke (identifier: DBCK) quality control reports be combined into one file for the convience of the user. The individual reports are seperated into Chapters 1 and 2.

On December 21, 2000 WOCEMET removed the WOCE designation for cruise AR_16_/06. The quality control information for this data has been left in this report for the user, but please note that the line previously known as AR_16_/06, is NOT a WOCE cruise line.

On December 21, 2000 WOCEMET changed the WOCE designator for the cruise AR_16_/08 (Chapter 1), AR_16_/09 (Chapter 2), and AR_16_/10 (Chapter 2) to the updated form, AR_06_/05 and AR_16_/08.

Chapter 1

Introduction:

The data referenced in this report were collected from the research vessel Heincke(call sign: DBCK; data provider: Inst. For Baltic Sea Research; PI: H.C. John) DATADIS Automatic Weather System(AWS) for 5 different WOCE cruises. The data were recieved in electronic format and converted to a standard FSU format. During the conversion, several changes were made to the data. These changes are outlined in Appendix A. Then they were preprocessed using an automated data checking program. Next a visual inspection was completed by a Data Quality Evaluator who reviewed, modified and added appropriate quality control (QC) flags to the data. Details of the WOCE QC can be found in Smith et al (1996). The data quality control report summarizes the flags for the Heincke AWS data, including those added by both the preprocessor and the analyst.

Statistical Information:

The first 4 cruises in the data set from the Heincke was expected to include minute resolution data taken in 4-1 hour intervals each day. The other 2 cruises include one minute resolution data taken for the entire day each day. The start and end dates, the number of records and values and the number and percentage of flags added are given in table 1.

Time (TIME), latitude (LAT), longitude (LON), platform course (PL_CRS), platform speed (PL_SPD), earth relative wind direction (DIR), earth relative wind speed (SPD), sea temperature (TS), atmospheric pressure (P), air temperature (T), and wet-bulb temperature (TW) were analyzed for all the cruises. In addition, platform speed measured by an electromagnetic log (PL_SPD2), and platform speed measured by a doppler log (PL_SPD3), were

Table 1: List of dates and number of records for each cruise.

Cruise:	Dates:	Number of Records	Number of Values	Number of Flags	Percentage Flagged
AR_16_/01	03/13/91 - 03/20/91	1261	16393	209	1.27
AR_16_/02	03/23/91 - 03/26/91	918	11934	67	0.56
AR_16_/03	04/02/91 - 04/10/91	2013	26169	936	3.58
AR_16_/06	10/16/91 - 10/19/91	270	3510	0	0.00
AR_16_/08	01/05/92 - 01/19/92	646	8398	50	1.90

analyzed for the first 3 cruises. Dew-point temperature (TD), and relative humidity (RH) were analyzed for the final 2 cruises. A total of 66404 values were analyzed with 1262 flags being added resulting in 1.90 percent of the data being flagged. The distribution of flags for each variable sorted by flag type is detailed in table 2.

Summary:

These data are in very good condition.

A: Significant problems

Only two problems that could be considered major exist in these data. The first is that the doppler log calibration is off, resulting in 578 observations for PL_SPD3 outside the bounds of normal platform movement. PL_SPD2 had 47 observations out of bounds as well. The second is that 308 of the observations for T, TW, and TD failed the $T \geq Tw \geq Td$ test. There is no cause for this that is obvious to the evaluator.

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

Variable	B	D	G	K	S	T	Number of Flags	Percentage of Data Flagged
TIME						44	44	0.86
LAT					1		1	0.02
LON					1		1	0.02
PL_CRS	1						1	0.02
PL_SPD					3		3	0.06
PL_SPD2	47						47	1.12
PL_SPD3	528						528	12.60
DIR				4			4	0.08
SPD			1	2			3	0.06
TS			1				1	0.02
P					2		2	0.04
T		289	2		1		292	5.72
TD		22					22	2.40
TW		308					308	6.03
RH							0	0.00
Totals:	576	619	4	6	8	44	1257	1.89
Percentage of Flags Added:	0.87	0.93	0.01	0.01	0.01	0.07	1.89	

B: Value out of accepted bounds
D: Values fail T≥Tw≥Td test
G: Value greater than 4 standard deviations from climatology
K: Value questionable/suspect
S: Spike in data
T: Time duplicate

<u>**B:** minor problems</u>:

- 44 “T” flags added to TIME for duplicate time stamps
- 4 “K” flags added to DIR, and 2 “K” flags added to SPD for suspect observations
- 8 “S” flags added for spikes in different variables

Final Note:

These data are in very good condition. The analyst foresees no problems using these data.

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 32310.

Appendix A

- At time 6324786 the wind direction of 0 has been converted to 360 degrees due to a wind speed of 90
- At time 6331877 the wind direction of 0 has been converted to 360 degrees due to a wind speed of 42
- At time 6335565 the wind speed of 0 has initiated a calm wind conversion.
- At time 6204254 the wind direction of 0 has been converted to 360 degrees due to a wind speed of 65

Chapter 2

Heincke AWS Data Quality Control Report (1992)

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Introduction:

This report summarizes the quality of surface meteorological data collected by the Heincke (identifier: DBCK) automated weather system during two WOCE cruises made in 1992. The data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by H. - Ch. John of the Zoology Institute and Museum. 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 Heincke AWS data and explains reasons why these flags were assigned.

Statistical Information:

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

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Platform Course (GPS)	(PL_CRS)
Platform Speed (GPS)	(PL_SPD)
Platform Speed (doppler speed log)	(PL_SPD2)
Earth Relative Wind Direction	(DIR)
Earth Relative Wind Speed	(SPD)
Sea Temperature	(TS)
Atmospheric Pressure	(P)
Air Temperature	(T)
Wet-bulb Temperature	(TW)
Dewpoint Temperature	(TD)

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 6,591 values are evaluated with 86 flags added by the preprocessor and Data Quality Evaluator for a total of 1.30 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_16_/09	1/21/92 - 1/29/92	374	4862	82	1.69
AR_16_/10	1/31/92 - 2/3/92	133	1729	4	0.23

Summary:

Most variables in the Heincke AWS data are of excellent quality. However, T, TW, and TD had a problem of frequent positive spikes of up to 5 degrees C on cruise AR_16_/09. Table 2 details all flags the distribution of flags among the variables and a thorough discussion of the flags immediately follows.

Table 2: Number of Flags and Percentage Flagged by Variable

Variable	B	G	S	Total Number of Flags	Percentage of Variable Flagged
PL_SPD2	20			20	3.94
SPD			1	1	0.20
T		3	39	42	8.28
TW			15	15	2.96
TD			8	8	1.58
Total number of Flags	20	3	63	86	1.30
Percentage of All Values Flagged	0.30	0.05	0.96	1.30	

<u>Spikes in T, TW, and TD</u>

The variables T and TW experience periodic positive spikes of up to 6 degrees C on cruise AR_16_/09. TD showed some negative spikes of the same magnitude. No physical explanation was available to verify these spikes as realistic, so they were assigned the “S” flag. Temperature seemed to be the most sensitive and received 39 “S” flags. TW and TD had fewer discernable spikes and were flagged less often.

This problem was not apparent on cruise AR_16_/10.

Negative values for PL_SPD2

PL_SPD2 received 20 "B" flags for negative values when the ship was nearly stationary. These values were only a fraction of one meter per second in magnitude and are not unusual in doppler speed log data.

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. T received three "G" flags during a relatively cold event on cruise AR_16_/09. The analyst believes these values are accurate, but the flags were left in place to call attention to the event.

Final Comments:

The Heincke AWS data is of excellent quality for most of the variables recorded. Values of T, TW, and TD flagged with an "S" are likely erroneous and should not be used.

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

Zierden, D. F. And S. R. Smith: *Meteor DVS Data Quality Control Report.* Report WOCEMET 97-19, Center for Ocean Atmospheric Prediction Studies, Florida State University, Tallahassee, FL 32301