Hawaiian Ocean Time Series Experiment Bridge Observations Quality Control Report

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March 10, 1997

Report WOCEMET 97-12

Version 1.0

Introduction:

The data referenced in this report are bridge observations collected during the Hawaiian Ocean Time Series Experiment by the research vessels Alpha Helix (identifier: ALHELIX), Kaimalino (KAIMALI), Thompson (KTDQ), Townsend Cromwell (TCROMWE), New Horizon (WKWB), Wecoma (WSD7079), and Moana Wave (WUS9293). The data provider was Fernando Santiago-Mondujano and the data were received in electronic format. A conversion to the standard FSU format was completed after modifications were made according to Appendix A. The data were then preprocessed using an automated data screening program. Next, the Data Quality Evaluator reviewed, modified and added appropriate quality control (QC) flags to the data. Details of the WOCE QC procedures can be found in Smith et al (1996). The data quality control report summarizes the flags for the Hawaiian Ocean Time Series Experiment bridge observations, including those added by both the preprocessor and the Data Quality Evaluator.

Statistical Information:

The data referenced in this report were expected to include observations taken approximately every 4 hours by the research vessel's bridge crew. Values for the following variables were collected, although some variables were not measured on different research vessels and cruises:

Time	(TIME)
Latitude	(LAT)
Longitude	(LON)
Platform Course	(PL_CRS)
Platform Speed	(PL_SPD)
Earth Relative Wind Direction (Meteorological)	(DIR)
Earth Relative Wind Speed	(SPD)
Sea Temperature	(TS)
Atmospheric Pressure	(P)
Air Temperature	(T)
Wet Bulb Temperature	(TW)
Present Weather	(WX)
Total Cloud Amount	(TCA)

The variables for which values were collected on each cruise are summarized in table 1. The platform relative wind speed and direction were also measured and can be made available to the

Table 1: Values Collected

RV/ CTC	TIME	LAT	LON	PL CRS	PL SPD	DIR	SPD	TS	P	T	TW	WX	TCA
ALHELIX													
PRS02_/28	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/29	X	X	X	X	X	X	X	X	X	X	X	X	X
KAIMALI													
PRS02_/04	X	X	X	X	X			X	X	X	X		
PRS02_/06	X	X	X	X	X			X	X	X	X		
PRS02_/07	X	X	X	X	X			X	X	X	X		
PRS02_/08	X	X	X	X	X			X	X	X	X		
PRS02_/09	X	X	X	X	X			X	X	X	X		
PRS02_/10	X	X	X	X	X			X	X	X	X		
PRS02_/14	X	X	X	X	X			X	X	X	X		
PRS02_/15	X	X	X	X	X			X	X	X	X		
PRS02_/17	X	X	X	X	X			X	X	X	X		
PRS02_/19	X	X	X	X	X			X	X	X	X		
KTDQ													
PRS02_/45	X	X	X	X	X	X	X	X	X	X	X	X	X
TCROMWE													
PRS02_/44	X	X	X	X	X	X	X	X	X	X	X	X	X
WKWB													
PRS02_/47	X	X	X	X	X	X	X	X	X	X	X	X	X
WSD7079													
PRS02_/16	X	X	X	X	X			X	X	X	X		
PRS02_/18	X	X	X	X	X			X	X	X	X		
PRS02_/31	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/32	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/33	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/34	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/35	X	X	X	X	X			X	X	X	X		
PRS02_/36	X	X	X	X	X			X	X	X	X		
PRS02_/46	X	X	X	X	X	X	X	X	X	X	X	X	X
WUS9293													
PRS02_/01	X	X	X	X	X			X	X	X	X		
PRS02_/01	X	X	X	X	X			X	X	X	X		
PRS02_/03	X	X	X	X	X			X	X	X	X		
PRS02_/05	X	X	X	X	X			X	X	X	X		
PRS02_/11	X	X	X	X	X			X	X	X	X		
PRS02_/12	X	X	X	X	X			X	X	X	X		
PRS02_/13	X	X	X	X	X			X	X	X	X		
PRS02_/20	X	X	X	X	X			X	X	X	X		
PRS02_/22	X	X	X	X	X			X	X	X	X		
PRS02_/30	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/37	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/38	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/39	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/40	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/41	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 1 (Cont.): Values Collected

RV/ CTC	TIME	LAT	LON	PL CRS	PL SPD	DIR	SPD	TS	P	T	TW	WX	TCA
WUS9293													
PRS02_/49	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/50	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/51	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/52	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/53	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/54	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/55	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/56	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/57	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/58	X	X	X	X	X	X	X	X	X	X	X	X	X
PRS02_/59	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 2: Statistical Cruise Information

RV/ CTC	Dates	Number of Records	Number of Values	Number of Flags	Percentage flagged
ALHELIX					
PRS02_/28	7/08/91 - 7/12/91	20	220	4	1.81
PRS02_/29	8/08/91 - 8/12/91	18	198	0	0.00
KAIMALI					
PRS02_/04	2/28/89 - 2/29/89	6	54	0	0.00
PRS02_/06	5/17/89 - 5/19/89	15	135	0	0.00
PRS02_/07	6/24/98 - 6/26/89	15	135	0	0.00
PRS02_/08	7/28/89 - 7/31/89	18	162	18	11.1
PRS02_/09	8/23/89 - 8/26/89	18	162	0	0.00
PRS02_/10	9/21/89 - 9/24/89	18	162	0	0.00
PRS02_/14	2/15/90 - 2/17/90	13	117	0	0.00
PRS02_/15	3/18/90 - 3/21/90	9	81	0	0.00
PRS02_/17	5/09/90 - 5/11/90	10	90	0	0.00
PRS02_/19	7/24/90 - 7/27/90	15	135	0	0.00
KTDQ					
PRS02_/45	2/16/93 - 2/18/93	13	143	0	0.00
TCROMWE					
PRS02_/44	1/20/93 - 1/22/93	15	165	0	0.00
WKWB					
PRS02_/47	5/19/93 - 5/22/93	15	165	0	0.00
WSD7079					
PRS02_/16	4/12/90 - 4/14/90	14	126	0	0.00
PRS02_/18	6/12/90 - 6/15/90	9	81	0	0.00
PRS02_/31	10/20/91 - 10/24/91	22	242	6	2.48
PRS02_/32	12/05/91 - 12/09/91	21	231	4	1.73
PRS02_/33	1/04/92 - 1/08/92	22	242	3	1.24
PRS02_/34	2/13/92 - 2/17/92	29	319	0	0.00
PRS02_/35	3/04/92 - 3/08/92	27	243	28	11.5

Table 2 (Cont.): Statistical Cruise Information

RV/ CTC	Dates	Number of Records	Number of Values	Number of Flags	Percentage Flagged
WSD7079					
PRS02_/36	4/16/92 - 4/20/92	24	216	0	0.00
PRS02_/46	4/13/93 - 4/16/93	19	209	0	0.00
WUS9293					
PRS02_/01	10/31/88 - 10/31/88	2	18	0	0.00
PRS02_/01	12/01/88 - 12/03/88	18	162	0	0.00
PRS02_/03	1/07/89 - 1/10/89	18	162	0	0.00
PRS02_/05	3/26/89 - 3/29/89	18	162	0	0.00
PRS02_/11	10/17/89 - 10/20/89	15	135	0	0.00
PRS02_/12	11/27/89 - 11/29/89	9	81	0	0.00
PRS02_/13	1/04/90 - 1/07/90	14	126	1	0.79
PRS02_/20	9/14/90 - 9/15/90	2	18	0	0.00
PRS02_/22	12/17/90 - 12/20/90	17	153	0	0.00
PRS02_/30	9/17/91 - 9/20/91	17	187	0	0.00
PRS02_/37	6/08/92 - 6/10/92	16	176	0	0.00
PRS02_/38	7/04/92 - 7/06/92	15	165	0	0.00
PRS02_/39	8/04/92 - 8/07/92	15	165	0	0.00
PRS02_/40	9/21/92 - 9/23/92	14	154	0	0.00
PRS02_/41	10/18/92 - 10/21/92	13	143	1	0.70
PRS02_/49	9/13/93 - 9/16/93	18	198	0	0.00
PRS02_/50	10/28/93 10/30/93	18	198	0	0.00
PRS02_/51	1/19/94 - 1/22/94	18	198	2	1.01
PRS02_/52	2/16/94 - 2/19/94	18	198	1	0.50
PRS02_/53	3/08/94 - 3/11/94	16	176	0	0.00
PRS02_/54	6/18/94 - 6/21/94	11	121	0	0.00
PRS02_/55	7/24/94 - 7/27/94	20	220	0	0.00
PRS02_/56	8/29/94 - 9/01/94	17	187	0	0.00
PRS02_/57	9/22/94 - 9/25/94	18	198	0	0.00
PRS02_/58	10/14/94 - 10/17/94	19	209	0	0.00
PRS02_/59	11/18/94 - 11/21/94	12	132	5	3.79

user upon request. The cruises for which DIR and SPD values are missing did not provide all of the variables necessary to correctly calculate true winds. Values for wind relative to the vessel, course, speed, and heading must all be present in order to calucuate SPD and DIR. Present weather (WX) and total cloud amount (TCA) data were collected on many of the cruises and may also be made available upon request. Other details of each cruise including start and end date, number of values, number of records, number of flags and percentage flagged are listed in table 2. A total of 8,075 values were evaluated with 73 flags added by preprocessor and Data Quality Evaluator for a total of 0.91 percent of the values being flagged. The distribution of these flags for each variable is detailed in table 3.

Table 3: Number of Flags and Percentage Flagged for Each Variable

Variable	B	F	K	S	T	Total Number of Flags	Percentage of Variable Flagged
TIME					8	8	1.03
LAT		4		4		8	0.90
LON		5	27	1		33	4.26
PL_CRS						0	0.00
PL_SPD						0	0.00
DIR			1			1	0.13
SPD						0	0.00
TS				1		1	0.13
P	19			1		20	2.58
T						0	0.00
TW				2		2	0.26
WX						0	0.00
TCA						0	0.00
Total Number of Flags	19	9	28	9	8	73	0.91
Percentage of flags Used	0.24	0.10	0.35	0.10	0.08	0.91	

Summary:

The bridge observations from the Hawaiian Ocean Time Series Experiment proved to be very reliable. No major or systematic errors were found in the data. Only a few minor problems were flagged.

Minor Problems:

- 18 “J” flags were applied to P on cruise PRS02_/08 for values over 1100 mb.
- 8 “T” flags were applied to TIME by the prescreener for time duplication.
- Isolated “F” and “S” flags were applied to LAT and LON by the prescreener and the evaluator.
- All LON values on cruises PRS02_/35 and PRS02_/36 were given “K” flags for fluctuations up to 2 degrees.
- Isolated “S” flags were applied to P, TS, and TW.

- Cruises PRS02_/01 and PRS02_/20 contained only two records each, so no evaluation by the Data Quality Evaluator was possible.

Final Note:

These data are in excellent condition and should prove reliable for the user. Keep in mind that some of the cruises are missing values for DIR, SPD, WX, and TCA.

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.

Appendix A: Modifications to HOTS Data

Some modifications were made to the Hawaiian Ocean Time Series Experiment data before they were prescreened and quality controlled by the Data Quality Evaluator. These changes are classified as major and minor modifications.

Major Modifications:

- All LON values were converted to degrees east to fit the DAC convention.
- PL_SPD and SPD were converted from knots to meters per second on all cruises (multiplied by 0.5144)
- All values less than zero were changed to -9999, the missing value flag, on PL_CRS, PL_SPD, TS, P, T, TW.

- SPD and DIR were checked for correct coding of calm winds. If the direction variable was zero and the corresponding speed value was greater than zero, then the direction value was changed to 360 degrees. Conversely, if the speed variable was zero and the corresponding direction value was greater than zero, then the direction value was changed to zero degrees.
- The following records were removed due to missing LAT/LON values:

Cruise	**TIME (year, mon., day, hr.)**
PRS02_/12	Nearly half of records
PRS02_/06	89 5 18 12
	89 5 19 12
	89 5 19 20
PRS02_/09	89 8 25 20
PRS02_/22	90 12 18 4

- The following cruises had out of sequence TIME values and were sorted into chronological order: PRS02_/02, PRS02_/12, PRS02_/18, PRS02_/31, PRS02_/32, PRS02_/33.
- Some or all of the P values on the following cruises were reported in inches of mercury and converted to millibars (multiplied by 33.86215): PRS02_/31, PRS02_/32, PRS02_/49, PRS02_/51, PRS02_/52, PRS02_/53, PRS02_/54, PRS02_/55

Minor Modifications:

- The hour in the TIME values 88 12 3 24 and 88 12 2 24 (YY MM DD HH) were changed from 24 to 0 to maintain a correct time sequence on cruise PRS02_/02.
- The dates in the last two values of the TIME variable were changed from 89 2 29 to 89 3 1 (YY MM DD) on cruise PRS02_/04 since 1989 was not a leap year.
- The month in the TIME value was changed from 91 1 19 0 to 91 9 19 0 (YY MM DD HH) to maintain a correct time sequence on cruise PRS02_/30.