COADS Bridge Data Quality Control Report

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Introduction:

The data referenced in this report are bridge observations obtained from the Comprehensive Ocean Atmosphere Data Set (COADS) (Slutz et. al.). The data originated on research vessels Takuyo (identifier: 7JWN), Hudson (identifier: CGDG), Sonne (identifier: DFCG), Le Noroit (identifier: FITA), Charles Darwin (identifier: GDLS), Chofu Maru (identifier: JCCX), Shumpu Maru (identifier: JFDG), Kaiyo (identifier: JRPG), T. Washington (identifier: KGWU), Tyro (identifier: PIBQ), Akademic A. Nesmeyanov (identifier: UBYK), Akademic Lavrentyev (identifier: UJFY), Franklin (identifier: VJJF), New Horizon (identifier: WKWB), Discoverer (identifier: WTEA), Vickers (identifier: WTEC), Malcom Baldrige (identifier: WTER), Oceanus (identifier: WXAQ), James Clarke Ross (identifier: ZDLP), and Agulhas (identifier: ZSAF). The data were provided to the Florida State University Data Assembly Center (DAC) in electronic format by and 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 (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 summaries the flags for the Comprehensive Ocean Atmospheric Data Set, including those added by both the preprocessor and the DQE.

Statistical Information:

The Comprehensive Ocean Atmospheric Data Set is expected to include observations taken at irregular time intervals on all 71 WOCE cruises. 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
Earth Relative Wind Direction	DIR
Earth Relative Wind Speed	SPD
Atmospheric Pressure	P
Air Temperature	T
Sea Temperature	TS
Dewpoint Temperature	TD
Wet Bulb Temperature	TW
Present Weather	WX
Total Cloud Amount	TCA
Low/Middle Cloud Amount	LMCA
Cloud Base Height	ZCL
Low Cloud Type	LCT
Middle Cloud Type	MCT
High Cloud Type	HCT

Sixteen of the 71 WOCE cruises were missing one or more of the variables listed above. These missing variables are listed by ship and cruise in Table 1.

Table 1: Missing Variables

RV/CTC	TD	TW	WX	LMCA	ZCL	LCT	MCT	HCT
CGDG								
AR_05_/01;A__04_/01; AR_20C/01;AR_22_/01		**X**						
AR_07W/02		**X**						
AR_07W/03		**X**						
AR_13_/05					**X**			
FITA								
PR_15_/18		**X**						
PR_15_/19		**X**						
JCCX								
PR_19_/01			**X**					
PR_19_/03		**X**	**X**					
JFDG								
PR_17_/04		**X**						
PR_17_/19					**X**			
PIBQ								
AR_07E/01		**X**						
AR_07E/02		**X**						
UBYK								
P__01W/00	**X**	**X**						
UJFY								
PR_13N/03	**X**	**X**						
WXAQ								
AR_11_/02		**X**		**X**		**X**	**X**	**X**
ZSAF								
ISS01_/01		**X**						

Details of the cruises are listed in Table 2 and include cruise dates, number of records, number of values, number of flags, and total percentage of data flagged. A total of 70,354 values were evaluated with 1,132 flags added by the preprocessor and the DQE for a total of 1.61% of the values being flagged. The coded data (WX, TCA, LMCA, ZCL, LCT, MCT, HCT) were not included in these statistics.

Table 2: Statistical Cruise Information

RV/CTC	Dates	Number of Records	Number of Values	Number of Flags	Percentage Flagged
CGDG					
AR_05_/01;A__04_/01; AR_20C/01;AR_22_/01	04/25/91 - 05/23/91	88	792	12	1.52
AR_07W/02	05/27/91 - 06/04/91	20	180	0	0.00
AR_07W/03	05/28/92 - 06/13/92	40	360	0	0.00
AR_10_/07	04/07/93 - 05/12/93	72	720	6	0.83
AR_07W/04	06/19/93 - 06/28/93	32	320	8	2.50
AR_13_/02;AR_19_/02; AR_22_/02	11/05/93 - 12/16/93	79	790	0	0.00
AR_07W/05;AR_13_/03	05/25/94 -06/12/94	45	450	1	0.22
AR_13_/04	10/13/94 - 11/09/94	91	910	4	0.44
AR_13_/05	04/20/95 - 05/16/95	60	600	2	0.33
A__01W/00	06/09/95 - 07/04/95	63	630	1	0.16
DFCG					
IR_04_/01	12/23/90 - 01/19/91	95	950	17	1.79
FITA					
PR_15_/17	02/01/91 - 03/03/91	139	1,390	10	0.72
PR_15_/18	03/11/91 - 04/06/91	83	747	6	0.80
PR_15_/19	07/18/91 - 08/13/91	70	630	7	1.11
PR_15_/20	01/02/92 - 02/16/92	224	2,240	7	0.31
PR_15_/21	02/21/92 - 03/17/92	185	1,850	7	0.38
PR_15_/22	08/06/92 - 08/31/92	177	1,770	10	0.56
PR_15_/23	09/05/92 - 10/02/92	173	1,730	13	0.75
AR_04_/05;AR_15_/16	09/09/95 - 10/11/95	239	2,390	21	1.51
GDLS					
AR_10_/03	05/09/92 - 06/07/92	113	1,130	9	0.80
AR_11_/08	10/01/92 - 10/20/92	59	590	3	0.51
AR_10_/08	04/23/93 - 05/24/93	125	1,250	24	1.92
JCCX					
PR_19_/01	11/13/90 - 11/16/90	25	250	3	1.20
PR_19_/02	11/18/90 - 11/21/90	29	290	0	0.00
PR_19_/03	11/07/91 - 11/08/91	12	108	0	0.00
PR_19_/05	11/08/92 - 11/18/92	75	750	14	1.87
JFDG					
PR_17_/04	10/14/91 - 10/16/91	22	198	0	0.00
PR_17_/17	10/01/94 - 10/05/94	37	370	0	0.00
PR_17_/19	07/01/95 - 07/05/95	34	340	0	0.00
JRPG					
PR_24_/02	10/06/92 - 10/19/92	15	150	0	0.00
PR_23_/03	12/13/92 - 12/23/92	56	560	9	1.61

KGWU						
	P__17C/00	06/03/91 - 07/11/91	132	1,320	1	0.08
	P__17S/00	07/17/91 - 08/25/91	120	1,200	10	0.83
	P__16C/00	09/01/91 - 10/01/91	85	850	10	1.18
PIBQ						
	AR_07E/01	07/03/90 - 08/02/90	64	576	5	0.87
	AR_07E/02	04/13/91 - 04/30/91	31	279	3	1.08
UBYK						
	P__01W/00	08/31/93 - 09/03/93	11	88	3	3.41
UJFY						
	PR_13N/03	05/13/93 - 06/08/93	75	600	0	0.00
VJJF						
	IR_04_/03	08/28/94 - 09/03/94	23	230	0	0.00
	IR_02_/01	11/20/94 - 12/01/94	22	220	7	3.18
	ISSO3_/01	04/01/95 - 04/22/95	66	660	3	0.45
	IR_06_/04	09/20/95 - 10/09/95	66	660	2	0.30
WKWB						
	PRS03_/04	11/17/94 - 12/04/94	29	290	1	0.34
WTEA						
	PR_16_/01	11/28/90 - 12/06/90	74	740	19	2.57
	P__16N/01	02/28/91 - 02/28/91	8	80	0	0.00
	P__16N/02	03/07/91 - 04/06/91	241	2,410	28	1.16
	PR_16_/03	11/01/91 - 11/13/91	231	2,310	36	1.56
	PR_16_/05	10/14/92 - 11/18/92	209	2,090	43	2.06
	PR_16_/09	09/18/93 - 10/15/93	168	1,680	40	2.38
	PR_16_/10	01/27/94 - 01/29/94	19	190	0	0.00
	PR_16_/14	02/06/95 - 05/02/95	189	1,890	15	0.79
	PR_16_/16	08/05/95 - 08/26/95	156	1,560	6	0.38
WTER						
	PR_16_/02	03/23/91 - 04/19/91	205	2,050	13	0.63
	PR_16_/04	02/23/92 - 03/26/92	255	2,550	34	1.33
	PR_16_/06	02/21/93 - 03/18/93	208	2,080	74	3.56
	PR_16_/07	04/18/93 - 05/14/93	221	2,210	66	2.99
	AR_21_/02	08/22/93 - 10/03/93	259	2,590	14	0.54
	PR_16_/11	04/16/94 - 05/09/94	229	2,290	75	3.28
	PR_16_/15	05/17/94 - 06/17/94	284	2,840	106	3.73
	PR_16_/12	08/04/94 - 08/25/94	215	2,150	138	6.42
	PR_16_/13	08/30/94 - 09/25/94	247	2,470	91	3.68
	IR_04_/05	08/24/95 - 09/25/95	238	1,380	0	0.00
WXAQ						
	AR_11_/02	06/19/91 - 07/04/91	8	72	0	0.00
ZDLP		11/20/93 - 12/18/93	64	640	14	2.19
	SR_01_/04					
ZSAF						
	ISS01_/01	04/05/91 - 05/07/91	186	1,674	81	4.84

Summary:

The overall quality of the bridge data for the COADS proves to be excellent, though the quality varies by ship and by cruise. The distribution of flags for each variable is detailed in Table 3.

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

Variable	B	D	F	G	L	S	T	Total Number of Flags	Percentage of Variable Flagged
TIME							497	497	6.99
LAT			57		1	166		225	3.16
LON			57		1	145		202	2.84
DIR	55					5		60	0.84
SPD				20		13		33	0.46
P				4		10		14	0.20
T		7		17		8		32	0.45
TS	6			16		16		38	0.53
TD		6				7		13	0.18
TW		13				5		18	0.25
WX								0	0.00
TCA								0	0.00
LMCA								0	0.00
ZCL								0	0.00
LCT								0	0.00
MCT								0	0.00
HCT								0	0.00
Total Number of Flags	61	26	114	57	2	375	497	1,132	
Percentage of All Values Flagged	0.09	0.04	0.16	0.08	0.00*	0.53	0.70	1.61	

*Percentage < 0.01

Time Duplicate Problem:

Almost seven percent of the time stamps were flagged with the T flag by the preprocessor, indicating time duplication. If there are two values for any given variables that share the same time stamp they will both be displayed at that time by the visual data assessment tool. In many cases, this problem caused spikes in the data. Often times if a spike occurred the DQE determined which value was real and flagged the other value as a spike (S). Though the time duplicate spike occurred throughout the data, it was most common in the position data. The user may wish to avoid using meteorological data at times flagged as duplicates.

Other Problems:

Latitude and Longitude received F flags indicating unrealistic platform velocity as determined by the position data. Both variables also received an L flag, denoting a position over land. Erroneous position reports are not uncommon to bridge data.

A total of 26 D flags were assigned by the preprocessor to T, TW, and TD for failing the T≥TW≥TD test. In the free atmosphere, the value of the temperature is always greater than or equal to the wet-bulb temperature, which in turn is always greater than or equal to the dewpoint temperature (Smith et al. 1996).

The G flag designates data that are four standard deviations from the COADS climatological means (da Silva et al. 1994).

The B flag assigned by the preprocessor designates a wind direction outside the 0 to 360 degree bounds. A value of 362 degrees refers to variable wind and a value of 361 degrees refers to calm wind in COADS data. All of these values were flagged with the B flag by the preprocessor, but can be considered as reliable data values.

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.

Slutz, R.J., S.J. Lubker, J.D. Hiscox, S.D. Woodruff, R.L. Jenne, D.H. Joseph, P.M. Seurer and J.D. Elms, 1985: COADS - Comprehensive Ocean Atmosphere Data Set, CIRES/ERL/NCAR/NCDC, Boulder, Colorado.