WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)
EXPERT TEAM ON MARINE CLIMATOLOGY

ETMC-I/Doc. 3.1
(16.VI.2004)

FIRST SESSION

ITEM 3.1

GDYNIA, POLAND, 7 TO 10 JULY 2004

Original: ENGLISH

REVIEW OF THE IMMT AND MQCS

(Submitted by GCC Germany)

Summary and Purpose of Document

This document presents a detailed proposal by GCC Germany on a revision of the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS) in accordance with the needs of the VOS Climate project.

ACTION PROPOSED

The Expert Team on Marine Climatology is invited to:

(a) Carefully review the proposed revision of the IMMT format and MQCS;

(b) Agree with or make further amendment to the proposal as appropriate;

(c) Make recommendations to be submitted to JCOMM-II.

Appendices: A. Draft Minimum Quality Control Standards (MQCS-V) (version 5, March 2004)

B. Draft Layout for the International Maritime Meteorological Tape (IMMT) (version IMMT-3, March 2004)

DISCUSSION

Introduction

1. The International Maritime Meteorological Tape (IMMT) format and the Minimum Quality Control Standards (MQCS) have been used for delayed mode collection and archival of the observations by Voluntary Observing Ships (VOS). They are included in the Manual on Marine Meteorological Services (WMO-No. 558) and Guide to Marine Meteorological Services (WMO-No. 471)

2. At the VOS Climate Project Fourth Project Meeting (London, 21-22 July 2003), it was recalled, that the current Minimum Quality Control Standards (MQCS-IV) did not extend to the additional elements introduced for the VOSClim project. In order to also include these VOSClim relevant parameters (El. 87-93 of IMMT-2) in the Minimum Quality Control, the VOSClim-IV considered a proposal by Dr Wagner, GCC Germany, and endorsed the revised MQCS (MQSC-IV) including these new elements as described in Appendix A. The proposal also includes an amendment with respect to ww, where a distinction has to be introduced, whether they originated from automatic stations or from observers. These changes are marked in red in Appendix A.

3. As the extended version of MQCS will have implications on the current version of the International Maritime Meteorological Tape format (IMMT-2), the ETMC meeting is invited to review the proposal for an appropriate extension of this format (IMMT-3), given as Appendix B, which changes are marked in red. Apart from some editorial amendments the extension includes the additional flags needed in the context of MQCS-V.

Action proposed

The Expert Team on Marine Climatology is invited to carefully review the proposed revision of the IMMT format and MQCS. The Team is requested to make recommendations on the revision to be submitted to JCOMM-II for its endorsement.

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Appendices: 2

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MINIMUM QUALITY CONTROL STANDARDS

MQCS-V (Version 5, March 2004)

NOTE See specification for quality control Indicators Q1 to Q20 at the end of this appendix
Δ = space (ASCII 32)

Element	Error	Action
1	$i_T \neq$ 3 - 5	Correct manually otherwise = Δ
2	AAAA ≠ valid year	Correct manually otherwise reject
3	MM ≠ 0l - l2	Correct manually otherwise reject
4	YY ≠ valid day of month	Correct manually otherwise reject
5	GG ≠ 00 - 23	Correct manually otherwise reject
6	Q ≠ 1, 3, 5, 7	Correct manually and Q_{20} = 5, otherwise Q_{20} = 4
	Q = Δ	Q_{20} = 2
7	$L_aL_aL_a$ ≠ 000-900	Correct manually and Q_{20} = 5, otherwise Q_{20} = 4
	$L_aL_aL_a$ = Δ Δ Δ	Q_{20} = 2
8	$L_oL_oL_oL_o$ ≠ 0000-1800	Correct manually and Q_{20} = 5, otherwise Q_{20} = 4
	$L_oL_oL_oL_o$ = Δ Δ Δ Δ	Q_{20} = 2
	$L_aL_aL_a$ = $L_oL_oL_oL_o$ = Δ Δ Δ (Δ)	Correct manually otherwise reject

Time sequence checks

	Change in latitude > 0.7° /hr	Correct manually otherwise Q_{20} = 3
	Change in longitude > 0.7° /hr when lat. 00-39.9	Correct manually otherwise Q_{20} = 3
	Change in longitude > 1.0° /hr when lat. 40-49.9	Correct manually otherwise Q_{20} = 3
	Change in longitude > 1.4° /hr when lat. 50-59.9	Correct manually otherwise Q_{20} = 3
	Change in longitude > 2.0° /hr when lat. 60-69.9	Correct manually otherwise Q_{20} = 3
	Change in longitude > 2.7° /hr when lat. 70-79.9	Correct manually otherwise Q_{20} = 3
9		No checking
10	h ≠ 0-9, Δ	Correct manually and Q_1 = 5, otherwise Q_1 = 4
	h = Δ	Q_1 = 9
11	VV ≠ 90-99, Δ Δ	Correct manually and Q_2 = 5, otherwise Q_2 = 4
	VV = Δ Δ	Q_2 = 9
12	N ≠ 0-9, Δ, /	Correct manually and Q_3 = 5, otherwise Q_3 = 4
	N < Nh	Correct manually and Q_3 = 5, otherwise Q_3 = 2
13	dd ≠ 00-36, 99	Correct manually and Q_4 = 5, otherwise Q_4 =4
	dd = ΔΔ, //	Q_4 = 9
	<u>dd versus ff</u>	
	dd = 00, ff ≠ 00	Correct manually and Q_4 or Q_5 = 5 otherwise Q_4 = Q_5 = 2
	dd ≠ 00, ff = 00	Correct manually and Q_4 or Q_5 = 5 otherwise Q_4 = Q_5 = 2

Element	Error	Action
14	$i_W \neq$ 0, 1, 3, 4	Correct manually, otherwise $Q_5 = 4$
15	ff > 80 knots	Correct manually and $Q_5 = 5$, otherwise $Q_5 = 3$
	ff = Δ Δ, //	$Q_5 = 9$
16	$s_n \neq$ 0, 1	Correct manually, otherwise $Q_6 = 4$
17	TTT = Δ Δ Δ, ///	$Q_6 = 9$
	If -25 > TTT >40 then	
	when Lat. < 45.0	
	TTT < -25	$Q_6 = 4$
	TTT > 40	$Q_6 = 3$
	when Lat. ≥ 45.0	
	TTT < -25	$Q_6 = 3$
	TTT > 40	$Q_6 = 4$

TTT versus humidity parameters

	TTT < WB (wet bulb)	Correct manually and $Q_6 = 5$, otherwise $Q_6 = Q_{19} = 2$
	TTT < DP (dew point)	Correct manually and $Q_6 = Q_7 = 5$, otherwise $Q_6 = Q_7 = 2$
18	$s_t \neq$ 0, 1, 2, 5, 6, 7	Correct manually, otherwise $Q_7 = 4$
19	DP > WB	Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_{19} = 2$
	DP > TTT	Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_6 = 2$
	WB = DP = Δ Δ Δ	$Q_7 = 9$
20	930 > PPPP > 1050 hPa	Correct manually and $Q_8 = 5$, otherwise $Q_8 = 3$
	870 > PPPP > 1070 hPa	Correct manually and $Q_8 = 5$, otherwise $Q_8 = 4$
	PPPP = Δ Δ Δ Δ	$Q_8 = 9$
21	ww = 22-24, 26, 36-39, 48, 49, 56, 57, 66-79, 83-88, 93-94 and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	if $i_X = 7$:	
	$w_a w_a$ = 24 - 25, 35, 47 - 48, 54-56, 64-68, 70-76, 85-87 and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
22, 23	W_1 or W_2 = 7 and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	$W_1 < W_2$	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 2$
	$W_1 = W_2$ = ww = Δ Δ Δ Δ	$Q_9 = 9$
24-27	N = 0, and $N_h C_L C_M C_H \neq 0$	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N = Δ, and $N_h C_L C_M C_H \neq$ Δ	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N = 9, and not (Nh =9 and $C_L C_M C_H$ = Δ)	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N= Δ,/ and $N_h C_L C_M C_H$ = Δ,/	$Q_3 = 9$
28	$s_n \neq$ 0, 1	Correct manually otherwise $Q_{10} = 4$
29	$T_W T_W T_W$ = Δ , ///	$Q_{10} = 9$
	if -2.0 > $T_W T_W T_W$ > 37.0 then	
	when Lat. < 45.0	
	$T_W T_W T_W$ < -2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$
	$T_W T_W T_W$ > 37.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	when Lat. ≥ 45.0	
	$T_W T_W T_W$ < -2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	$T_W T_W T_W$ > 37.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$
30	Indicator ≠ 0-7, Δ	Correct manually, make it Δ if not correctable

Element	Error	Action
31	Indicator ≠ 0-9, Δ	Correct manually, make it Δ if not correctable
32	20 < P_WP_W < 30	Q_{11} = 3
	P_WP_W ≥ 30 and ≠ 99	Q_{11} = 4
	P_WP_W = ΔΔ, //	Q_{11} = 9
33	35< H_WH_W < 50	Q_{12} = 3
	H_WH_W ≥ 50	Q_{12} = 4
	H_WH_W = Δ Δ , //	Q_{12} = 9
34	d_{W1} d_{W1} ≠ 00-36, 99, ΔΔ	Correct manually and Q_{13} = 5, otherwise Q_{13} = 4
	$swell_1$ = $swell_2$ = Δ	Q_{13} = 9
35	25 < $P_{W1}P_{W1}$ < 30	Q_{13} = 3
	$P_{W1}P_{W1}$ ≥ 30 and ≠ 99	Q_{13} = 4
36	35 < $H_{W1}H_{W1}$ < 50	Q_{13} = 3
	$H_{W1}H_{W1}$ ≥ 50	Q_{13} = 4
37	I_S ≠ 1-5, Δ	Correct manually, otherwise Δ
38	E_SE_S ≠ 00-99, ΔΔ	Correct manually, otherwise ΔΔ
39	R_S ≠ 0-4, Δ	Correct manually, otherwise Δ
40	Source ≠ 0-6	Correct manually, otherwise Δ
41	Platform ≠ 0-9	Correct manually, otherwise Δ
42	No call sign	Insert manually, mandatory entry
43	No country code	Insert manually
44		No Quality Control
45	Q ≠ 0-6, 9	Correct manually, otherwise Δ
46	i_X ≠ 1-7	Correct manually, otherwise Δ
47	i_R = 0-2 and RRR = 000, ///, ΔΔΔ	Correct manually, otherwise Q_{14} = 4
	i_R = 3 and RRR ≠ ///, ΔΔΔ	Correct manually, otherwise Q_{14} = 2
	i_R =4 and RRR ≠ ///, ΔΔΔ	Correct manually, otherwise Q_{14} = 2
	i_R ≠ 0- 4	Correct manually, otherwise Q_{14} = 4
48	RRR ≠ 001 - 999 and i_R = 1, 2	Correct manually and Q_{14} = 5, otherwise Q_{14} = 2
49	t_R ≠ 0-9	Correct manually and Q_{14} = 5, otherwise Q_{14} = 4
50	s_W ≠ 0, 1, 2, 5, 6, 7	Correct manually, otherwise Q_{19} = 4
51	WB < DP	Correct manually and Q_{19} = 5, otherwise Q_{19} = Q_7=2
	WB = ///, ΔΔΔ	Q_{19} = 9
	WB > TTT	Correct manually and Q_{19} = 5, otherwise Q_{19} =Q_6 = 2
52	a ≠ 0-8, Δ	Correct manually and Q_{15} = 5, otherwise Q_{15} = 4
	a = 4 and ppp □ 000	Correct manually and Q_{15} or Q_{16} = 5, otherwise Q_{15}=Q_{16}=2
	a =1,2,3,6,7,8 and ppp=0	Correct manually and Q_{15} or Q_{16} = 5, otherwise Q_{15}=Q_{16} = 2
	a = Δ	Q_{15} = 9
53	250 ≥ ppp > 150	Correct manually and Q_{16} = 5, otherwise Q_{16} = 3
	ppp > 250	Correct manually and Q_{16} = 5 otherwise Q_{16} = 4
	ppp = ΔΔΔ	Q_{16} = 9
54	D_s ≠ 0-9, Δ, /	Correct manually and Q_{17} = 5, otherwise Q_{17} = 4
	D_s = Δ, /	Q_{17} = 9
55	V_s ≠ 0-9, Δ, /	Correct manually and Q_{18} = 5, otherwise Q_{18} = 4
	V_s = Δ , /	Q_{18} = 9

Element	Error	Action
56	$d_{w2}d_{w2} \neq$ 00-36, 99	Correct manually and $Q_{13} = 5$, otherwise $Q_{13} = 4$
57	$25 < P_{w2}P_{w2} < 30$	$Q_{13} = 3$
	$P_{w2}P_{w2} \geq 30$ and $\neq 99$	$Q_{13} = 4$
58	$35 < H_{w2}H_{w2} < 50$	$Q_{13} = 3$
	$H_{w2}H_{w2} \geq 50$	$Q_{13} = 4$
59	$c_i \neq$ 0-9, Δ, /	Correct manually, otherwise Δ
60	$S_i \neq$ 0-9, Δ, /	Correct manually, otherwise Δ
61	$b_i \neq$ 0-9, Δ, /	Correct manually, otherwise Δ
62	$D_i \neq$ 0-9, Δ, /	Correct manually, otherwise Δ
63	$z_i \neq$ 0-9, Δ, /	Correct manually, otherwise Δ
86	Minimum Quality Control Standards (MQCS) version identification	1= MQCS-I (Original version) 2= MQCS-II (Version 2, May 1996) 3= MQCS-III (Version 3, May 2000) 4= MQCS-IV (Version 4, June 2001) 5= MQCS-V (Version 5, March 2004) present version
87	HDG ≠ 000-360	correct manually and $Q_{22} = 5$, otherwise $Q_{22} = 4$
	HDG = ΔΔΔ, ///	$Q_{22} = 9$
88	COG ≠ 000-360	correct manually and $Q_{23} = 5$, otherwise $Q_{23} = 4$
	COG = ΔΔΔ, ///	$Q_{23} = 9$
89	SOG ≠ 00 - 99	correct manually and $Q_{24} = 5$, otherwise $Q_{24} = 4$
	SOG = ΔΔ, //	$Q_{24} = 9$
	SOG > 33	correct manually and $Q_{24} = 5$, otherwise $Q_{24} = 3$
90	SLL ≠ 00-99	correct manually and $Q_{25} = 5$, otherwise $Q_{25} = 4$
	SLL = ΔΔ, //	$Q_{25} = 9$
	SLL > 32	correct manually and $Q_{25} = 5$, otherwise $Q_{25} = 3$
91	$s_L \neq 0,1$	correct manually and $Q_{26} = 5$, otherwise $Q_{26} = 4$
	s_L = Δ, /	$Q_{26} = 9$
	hh ≠ 00 – 99	correct manually and $Q_{27} = 5$, otherwise $Q_{27} = 4$
	hh = ΔΔ, //	$Q_{27} = 9$
	hh >= 13	correct manually and $Q_{27} = 5$, otherwise $Q_{27} = 3$
	hh < -01	correct manually and $Q_{27} = 5$, otherwise $Q_{27} = 4$
92	RWD ≠ 000 - 360, 999	correct manually and $Q_{28} = 5$, otherwise $Q_{28} = 4$
	RWD = ΔΔΔ, ///	$Q_{28} = 9$
93	RWS ≠ 000 - 999	correct manually and $Q_{29} = 5$, otherwise $Q_{29} = 4$
	RWS = ΔΔΔ, ///	$Q_{29} = 9$
	RWS > 110 kts	correct manually and $Q_{29} = 5$, otherwise $Q_{29} = 3$

Element	Error	Action
	RWD versus RWS	
	RWD = 000, RWS ≠ 000	correct manually and Q_{28} or Q_{29} = 5, otherwise $Q_{28} = Q_{29} = 2$
	RWD ≠ 000, RWS = 000	correct manually and Q_{28} or Q_{29} = 5, otherwise $Q_{28} = Q_{29} = 2$

Specifications for quality control Indicators Q_1 to Q_{29}

0 No quality control (QC) has been performed on this element
1 QC has been performed; element appears to be correct
2 QC has been performed; element appears to be inconsistent with other elements
3 QC has been performed; element appears to be doubtful
4 QC has been performed; element appears to be erroneous
5 The value has been changed as a result of QC
6 reserved for GCC
7 reserved for GCC
8 Reserve
9 The value of the element is missing

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(REVISED; MARCH, 2004)

LAYOUT FOR THE INTERNATIONAL MARITIME METEOROLOGICAL TAPE (IMMT)

[VERSION IMMT-3]

Element Number	*Character Number*	*Code*	*Element*	*Coding procedure*
1	1	i_T	Format/temperature indicator	3=IMMT format with temperatures in tenths of °C 4=IMMT format with temperatures in halves of °C 5=IMMT format with temperatures in whole °C
2	2-5	AAAA	Year UTC	Four digits
3	6-7	MM	Month UTC	01 - 12 January to December
4	8-9	YY	Day UTC	01 - 31
5	10-11	GG	Time of observation	Nearest whole hour UTC, WMO specifications
6	12	Q_C	Quadrant of the globe	WMO code table 3333
7	13-15	$L_aL_aL_a$	Latitude	Tenths of degrees, WMO specifications
8	16-19	$L_oL_oL_oL_o$	Longitude	Tenths of degrees
9	20		Cloud height (h) and visibility (VV) measuring indicator	0 - h and VV estimated 1 - h measured, VV estimated 2 - h and VV measured 3 - h estimated, VV measured
10	21	h	Height of clouds	WMO code table 1600
11	22-23	VV	Visibility	WMO code table 4377
12	24	N	Cloud amount	Oktas, WMO code table 2700; show 9 where applicable
13	25-26	DD	True wind direction	Tens of degrees, WMO code table 0877; show 00 or 99 where applicable
14	27	i_W	Indicator for wind speed	WMO code table 1855
15	28-29	ff	Wind speed	Tens and units of knots or meters per second, hundreds omitted; values in excess of 99 knots are to be indicated in units of meters per second and I_W encoded accordingly; the method of estimation or measurement and the units used (knots or meters per second) are indicated in element 14
16	30	s_n	Sign of temperature	WMO code table 3845
17	31-33	TTT	Air temperature	Tenths of degrees Celsius
18	34	s_t	Sign of dew-point temperature	0 - positive or zero measured dew-point temperature 1 - negative measured dew-point temperature 2 - iced measured dew-point temperature 5 - positive or zero computed dew-point temperature 6 - negative computed dew-point temperature 7 - iced computed dew-point temperature
19	35-37	$T_dT_dT_d$	Dew-point temperature	Tenths of degrees Celsius
20	38-41	PPPP	AIR PRESSURE	TENTHS OF HECTOPASCALS

Element Number	*Character Number*	*Code*	*Element*	*Coding procedure*
21	42-43	ww	Present weather	WMO code table 4677 or 4680
22	44	W_1	Past weather	WMO code table 4561 or 4531
23	45	W_2	Past weather	WMO code table 4561 or 4531
24	46	N_h	Amount of lowest clouds	As reported for C_L or, if no C_L cloud is present, for C_M, in oktas; WMO code table 2700
25	47	C_L	Genus of C_L clouds	WMO code table 0513
26	48	C_M	Genus of C_M clouds	WMO code table 0515
27	49	C_H	Genus of C_H clouds	WMO code table 0509
28	50	s_n	Sign of sea-surface temperature	WMO code table 3845
29	51-53	$T_wT_wT_w$	Sea surface temperature	Tenth of degrees Celsius
30	54		Indicator for sea-surface temperature measurement	0 - Bucket thermometer 1 - Condenser inlet 2 - Trailing thermistor 3 - Hull contact sensor 4 - “Through hull” sensor 5 - Radiation thermometer 6 - Bait tanks thermometer 7 - Others
31	55		Indicator for wave measurement	Shipborne wave recorder: 0 - Wind sea and swell estimated; 1 - Wind sea and swell measured; 2 - Mixed wave measured, swell estimated; 3 - Other combinations measured and estimated Buoy: 4 - Wind sea and swell measured; 5 - Mixed wave measured, swell estimated; 6 - Other combinations measured and estimated Other measurement system: 7 - Wind sea and swell measured; 8 - Mixed wave measured, swell estimated; 9 - Other combinations measured and estimated
32	56-57	P_wP_w	Period of wind waves or of measured waves	Whole seconds; show 99 where applicable in accordance with Note (3) under specification of P_wP_w in the Manual on Codes
33	58-59	H_wH_w	Height of wind waves or of measured waves	Half-meter values. Examples: Calm or less than $^1/_4$m to be encoded 00; $3^1/_2$m to be encoded 07; 7m to be encoded 14; $11^1/_2$m to be encoded 23
34	60-61	$d_{w1}d_{w1}$	Direction of predominant swell waves	Tens of degrees, WMO code table 0877; encoded 00 or 99 where applicable. Blanks = No observation of waves attempted
35	62-63	$P_{w1}P_{w1}$	Period of predominant swell waves	Whole seconds; encoded 99 where applicable (see under element 32)
36	64-65	$H_{w1}H_{w1}$	Height of predominant swell waves	Half-meter values (see under element 33)
37	66	I_S	Ice accretion on ships	WMO code table 1751
38	67-68	E_SE_S	Thickness of ice accretion	In centimeters
39	69	R_S	Rate of ice accretion	WMO code table 3551
40	70		Source of observation	0 - Unknown 1 - Logbook (National) 2 - Telecommunication channels (National) 3 - Publications (National) 4 - Logbook (International data exchange) 5 - Telecommunication channels (International data exchange) 6 – Publications (International data exchange)

Element Number	*Character Number*	*Code*	*Element*	*Coding procedure*
41	71		Observation platform	0 - unknown 1 - Selected ship 2 - Supplementary ship 3 - Auxiliary ship 4 - Automated station/data buoy 5 - Fixed sea station 6 - Coastal station 7 - Aircraft 8 - Satellite 9 - Others ....
42	72-78		Ship identifier	Ship's call sign or other identifier encoded as follows: 7 characters call sign Columns 72–78 6 characters call sign Columns 72–77 5 characters call sign Columns 72–76 4 characters call sign Columns 72–75 3 characters call sign Columns 72–74
43	79-80		Country which has recruited the ship	According to the two-character alphabetical codes assigned by the International Organization for Standardization (ISO)
44	81		National use	
45	82		Quality control indicator	0 - No quality control (QC) 1 - Manual QC only 2 - Automated QC only /MQC (no time-sequence checks) 3 - Automated QC only (inc. time sequence checks) 4 - Manual and automated QC (superficial; no automated time-sequence checks) 5 - Manual and automated QC (superficial; including time-sequence checks) 6 - Manual and automated QC (intensive, including automated time-sequence checks) 7 & 8 - Not used 9 - National system of QC (information to be furnished to WMO)
46	83	i_X	Weather data indicator	1 - Manual 4 - Automatic If present and past weather data included Code tables 4677 and 4561 used 7 - Automatic If present and past weather data included Code tables 4680 and 4531 used
47	84	i_R	Indicator for inclusion or omission of precipitation data	WMO code table 1819
48	85-87	RRR	Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by t_R	WMO code table 3590
49	88	t_R	Duration of period of reference for amount of precipitation, ending at the time of the report	WMO code table 4019
50	89	s_W	Sign of wet-bulb temperature	0 - positive or zero measured wet-bulb temperature 1 - negative measured wet-bulb temperature 2 - iced measured wet-bulb temperature 5 - positive or zero computed wet-bulb temperature 6 - negative computed wet-bulb temperature 7 - iced computed wet-bulb temperature
51	90-92	$T_bT_bT_b$	Wet-bulb temperature	In tenths of degree Celsius, sign given by element 50
52	93	a	Characteristic of pressure tendency during the three hours preceding the time of observation	WMO code table 0200

Element Number	*Character Number*	*Code*	*Element*	*Coding procedure*
53	94-96	ppp	Amount of pressure tendency at station level during the three hours preceding the time of observation	In tenths of hectopascal
54	97	D_S	True direction of resultant displacement of the ship during three hours preceding the time of observation	WMO code table 0700
55	98	v_S	Ship's average speed made good during the three hours preceding the time of observation	WMO code table 4451
56	99-100	$d_{w2}d_{w2}$	Direction of secondary swell waves	Tens of degrees, WMO code table 0877; encoded 00 or 99 where applicable. Blanks = No observation of waves attempted
57	101-102	$P_{w2}P_{w2}$	Period of secondary swell waves	Whole seconds; encoded 99 where applicable (see under element 32)
58	103-104	$H_{w2}H_{w2}$	Height of secondary swell waves	Half-meter values (see under element 33)
59	105	c_i	Concentration or arrangement of sea ice	WMO code table 0639
60	106	S_i	Stage of development	WMO code table 3739
61	107	b_i	Ice of land origin	WMO code table 0439
62	108	D_i	True bearing of principal ice edge	WMO code table 0739
63	109	z_i	Present ice situation and trend of conditions over preceding three hours	WMO code table 5239
64	110		FM 13 code version	0 = previous to FM 24-V 1 = FM 24-V 2 = FM 24-VI Ext. 3 = FM 13-VII 4 = FM 13-VIII 5 = FM 13-VIII Ext. 6 = FM 13-IX 7 = FM 13-IX Ext. 8 = FM 13-X, etc.
65	111		IMMT version	0 = IMMT version just prior to version number being included 1 = IMMT-1 (previous version) 2 = IMMT-2 (previous version) 3 = IMMT-3, (this version) 4 = IMMT-4, (next version) etc.
66	112	Q_1	Quality control indicator for (h)	0 - no quality control (QC) has been performed in this element 1 - QC has been performed; element appears to be correct 2 - QC has been performed; element appears to be inconsistent with other elements 3 - QC has been performed; element appears to be doubtful 4 - QC has been performed; element appears to be erroneous 5 - The value has been changed as a result of QC 6 - 8 Reserve 9 - The value of the element missing
67	113	Q2	QC indicator for (VV)	- idem -
68	114	Q_3	QC indicator for (clouds: elements 12, 24–27)	- idem -
69	115	Q_4	QC indicator for (dd)	- idem -
70	116	Q_5	QC indicator for (ff)	- idem -

Element Number	*Character Number*	*Code*	*Element*	*Coding procedure*
71	117	Q_6	QC indicator for (TTT)	- idem -
72	118	Q_7	QC indicator for ($T_dT_dT_d$)	- idem -
73	119	Q_8	QC indicator for (PPPP)	- idem -
74	120	Q_9	QC indicator for (weather: elements 21–23)	- idem -
75	121	Q_{10}	QC indicator for ($T_wT_wT_w$)	- idem -
76	122	Q_{11}	QC indicator for (P_wP_w)	- idem -
77	123	Q_{12}	QC indicator for (H_wH_w)	- idem -
78	124	Q_{13}	QC indicator for (swell: elements 34–36, 56–58)	- idem -
79	125	Q_{14}	QC indicator for (i_RRRRt_R)	- idem -
80	126	Q_{15}	QC indicator for (a)	- idem -
81	127	Q_{16}	QC indicator for (ppp)	- idem -
82	128	Q_{17}	QC indicator for (D_s)	- idem -
83	129	Q_{18}	QC indicator for (v_s)	- idem -
84	130	Q_{19}	QC indicator for ($t_bt_bt_b$)	- idem -
85	131	Q_{20}	QC indicator for ships' position	- idem -
86	132	Q_{21}	Minimum quality control standards (MQCS) version identification	1 = MQCS- I (Original version) 2 = MQCS-II (Version 2, May 1996) 3 = MQCS-III (Version 3, May 2000) 4 = MQCS-IV (Version 4, June 2001) 5 = MQCS-V (Version 5, March 2004) ETC.

Additional Requirements for the VOSCLIM Project

87	133-135	HDG	Ship's heading; the direction to which the bow is pointing, referenced to true North.	(000-360); e.g. 360 = North 000 = No Movement 090 = East
88	136-138	COG	Ship's ground course; the direction the vessel actually moves over the fixed earth and referenced to True North	(000-360); e.g. 360 = North 000 = No Movement 090 = East
89	139-140	SOG	Ship's ground speed; the speed the vessel actually moves over the fixed earth.	(00-99); Round to nearest whole knot
90	141-142	SLL	Maximum height in meters of deck cargo above Summer maximum load line.	(00-99); report to nearest whole meter

91	143-145	$s_L$hh	Departure of reference level (Summer maximum load line) from actual sea level. Consider the difference positive when the Summer maximum load line is above the level of the sea and negative if below the water line.	position 143 (s_L) sign position;, 0 = positive or zero, 1 = negative positions 144-145 (hh); (00-99) is the difference to the nearest whole meter between the Summer maximum load line and the sea level.
92	146-148	RWD	Relative wind direction in degrees off the bow	Relative wind direction; e.g. 000 = no apparent relative wind speed (calm conditions on deck). Reported direction for relative wind = 001-360 degrees in a clockwise direction off the bow of the ship. When directly on the bow, RWD = 360.
93	149-151	RWS	Relative wind speed reported in units indicated by i_W (knots or m/s)	Reported in either whole knots or whole meters per second (e.g. 010 knots or 005 m/s). Units established by i_W as indicated in Character Number 27.

Note: Since the relative wind speed can be greater than the true wind speed e.g., i_W indicates knots and ff = 98, the relative wind speed may be 101 knots; therefore, three positions must be allocated since i_W cannot be adjusted and the relative wind speed converted to meters per second as is done in element 15.

94	152	Q_{22}	Quality control indicator for (HDG)	0 - no quality control (QC) has been performed in this element 1 - QC has been performed; element appears to be correct 2 - QC has been performed; element appears to be inconsistent with other elements 3 - QC has been performed; element appears to be doubtful 4 - QC has been performed; element appears to be erroneous 5 - The value has been changed as a result of QC 6 - 8 Reserve 9 - The value of the element missing
95	153	Q_{23}	QC indicator for (COG)	- idem –
96	154	Q_{24}	QC indicator for (SOG)	- idem –
97	155	Q_{25}	QC indicator for (SLL)	- idem –
98	156	Q_{26}	QC indicator for (s_L)	- idem –
99	157	Q_{27}	QC indicator for (hh)	- idem –
100	158	Q_{28}	QC indicator for (RWD)	- idem –
101	159	Q_{29}	QC indicator for (RWS)	- idem -

Note: Most of the codes (groups of letters) in the IMMT format with the exception of those added for the VOSCLIM project are defined in the Manual on Codes (WMO Pub.No. 306) as they basically mirror the code groups used in FM 13-X Ship code. Because CBS was not persuaded to expand the FM 13-X Ship code for the VOSCLIM project the additional observed elements (selected codes) will not appear in WMO Manual on Codes (Pub. 306). Therefore an effort was made to select unique codes (groups of letters) not defined in WMO Pub. 306 for the elements added to the IMMT-2 format version modified for the VOSCLIM project. This was deliberately done to try and prevent a difference in meaning for a given code group (identical symbolic letters) in Pub 306 versus that in IMMT. Presumably none of the Character Code formats will be altered in the future by CBS.