CONTENTS

[Manual on Codes, Volume I.2] Part B/GRIB edition 2

1. GRIB templates and parameters for reforecast ensemble data

Add product definition templates:

Product definition template 4.60 – individual ensemble reforecast, control and perturbed, at a horizontal level or in a horizontal layer at a point in time

Octet No.	Contents
10	Parameter category (see Code table 4.1)
11	Parameter number (see Code table 4.2)
12	Type of generating process (see Code table 4.3)
13	Background generating process identifier (defined by originating centre)
14	Analysis or forecast generating process identifier (defined by originating centre)
15–16	Hours of observational data cut-off after reference time (see Note 1)
17	Minutes of observational data cut-off after reference time
18	Indicator of unit of time range (see Code table 4.4)
19–22	Forecast time in units defined by octet 18
23	Type of first fixed surface (see Code table 4.5)
24	Scale factor of first fixed surface
25–28	Scaled value of first fixed surface
29	Type of second fixed surface (see Code table 4.5)
30	Scale factor of second fixed surface
31–34	Scaled value of second fixed surface
35	Type of ensemble forecast (see Code table 4.6)
36	Perturbation number
37	Number of forecasts in ensemble
38–39	Year of model version date (see Note 2)
40	Month of model version date
41	Day of model version date
42	Hour of model version date
43	Minute of model version date
44	Second of model version date

Notes:
(1) Hours greater than 65534 will be coded as 65534.
(2) This is the date when the reforecast is produced with a particular version of the model.

Product definition template 4.61 – individual ensemble reforecast, control and perturbed, at a horizontal level or in a horizontal layer, in a continuous or non-continuous time interval

Octet No.	Contents
10	Parameter category (see Code table 4.1)
11	Parameter number (see Code table 4.2)
12	Type of generating process (see Code table 4.3)
13	Background generating process identifier (defined by originating centre)
14	Forecast generating process identifier (defined by originating centre)
15–16	Hours after reference time of data cut-off (see Note 1)
17	Minutes after reference time of data cut-off
18	Indicator of unit of time range (see Code table 4.4)
19–22	Forecast time in units defined by octet 18 (see Note 2)
23	Type of first fixed surface (see Code table 4.5)

24	Scale factor of first fixed surface
25–28	Scaled value of first fixed surface
29	Type of second fixed surface (see Code table 4.5)
30	Scale factor of second fixed surface
31–34	Scaled value of second fixed surface
35	Type of ensemble forecast (see Code table 4.6)
36	Perturbation number
37	Number of forecasts in ensemble
38–39	Year of model version date (see Note 3)
40	Month of model version date
41	Day of model version date
42	Hour of model version date
43	Minute of model version date
44	Second of model version date
45–46	Year of end of overall time interval
47	Month of end of overall time interval
48	Day of end of overall time interval
49	Hour of end of overall time interval
50	Minute of end of overall time interval
51	Second of end of overall time interval
52	n – number of time range specifications describing the time intervals used to calculate the statistically processed field
53–56	Total number of data values missing in statistical process
	57–68 Specification of the outermost (or only) time range over which statistical processing is done
57	Statistical process used to calculate the processed field from the field at each time increment during the time range (see Code table 4.10)
58	Type of time increment between successive fields used in the statistical processing (see Code table 4.11)
59	Indicator of unit of time for time range over which statistical processing is done (see Code table 4.4)
60–63	Length of the time range over which statistical processing is done, in units defined by the previous octet
64	Indicator of unit of time for the increment between the successive fields used (see Code table 4.4)
65–68	Time increment between successive fields, in units defined by the previous octet (see Note 4)
	69–nn These octets are included only if n>1, where nn=56 + 12 x n
69–80	As octets 57 to 68, next innermost step of processing
81–nn	Additional time range specifications, included in accordance with the value of n. Contents as octets 57 to 68, repeated as necessary

Notes:

(1) Hours greater than 65534 will be coded as 65534.

(2) The reference time in section 1 and the forecast time together define the beginning of the overall time interval.

(3) This is the date when the reforecast is produced with a particular version of the model.

(4) An increment of zero means that the statistical processing is the result of a continuous (or near continuous) process, not the processing of a number of discrete samples. Examples of such continuous processes are the temperatures measured by analogue maximum and minimum thermometers or thermographs, and the rainfall measured by a raingauge. The reference and forecast times are successively set to their initial values plus or minus the increment, as defined by the type of time increment (one of octets 51, 63, 75 ...). For all but the innermost (last) time range, the next inner range is then processed using these reference and forecast times as the initial reference and forecast times.

Add entries to GRIB2 Code table 4.0:

Code figure	Meaning
60	Individual ensemble reforecast, control and perturbed, at a horizontal level or in a horizontal layer at a point in time
61	Individual ensemble reforecast, control and perturbed, at a horizontal level or in a horizontal layer, in a continuous or non-continuous time interval

Add entries to GRIB2 Code table 4.2:

Product Discipline	Parameter Category	Parameter number	Parameter	Units
0	2	37	Northward turbulent surface stress***	N m^{-2} s
0	2	38	Eastward turbulent surface stress***	N m^{-2} s

*** Statistical process 1 (Accumulation) does not change units.

Product Discipline	Parameter Category	Parameter number	Parameter	Units
2	0	33	Water runoff and drainage****	kg m^{-2}
2	0	34	Surface water runoff****	kg m^{-2}

**** Statistical process 1 (Accumulation) does not change units.

2. New production status of data in GRIB2 Code table 1.3

Add entries to GRIB2 Code table 1.3:

Code figure	Meaning
6	S2S operational products
7	S2S test products

3. Various parameters in GRIB2 Code table 4.2

Add entries to GRIB2 Code table 4.2:

Product Discipline	Parameter Category	Parameter number	Parameter	Units
0	0	21	Apparent temperature (see Note x)	K
0	2	36	Amplitude function for Rossby wave envelope for meridional wind (see Note x+1)	m s^{-1}
0	17	0	Lightning strike density	m^{-2} s^{-1}
2	4	4	Fosberg index (see Note x+2)	Numeric

Notes:

(x) Apparent temperature is the perceived outdoor temperature, caused by a combination of phenomena, such as air temperature, relative humidity and wind speed.

(x+1) This parameter is described in more detail by (a) Lee, S., and I.M. Held, 1993: Baroclinic wave packets in models and observations. J Atmos. Sci., 50, 1413-1428, (b) Chang,

E.K.M., 1993: Downstream development of baroclinic waves as inferred from regression analysis. J. Atmos. Sci., 50, 2038-2053, (c) Archambault, H.M., D. Keyser, and L.F. Bosart, 2010: Relationships between large-scale regime transitions and major cool-season precipitation events in the northeastern United States. Mon Wea. Rev., 138, 3454-3473, and (d) Zimin, A.V., I. Szunyogh, B.R. Hung, and E. Orr, 2006: Extracting envelopes of nonzonally propagating Rossby wave packets. Mon. Wea. Review, 134, 1329-1333.

(x+2) The Fosberg index denotes the potential influence of weather on a wildland fire. It takes into account the combined effects of temperature, wind speed, relative humidity and precipitation. Higher values indicate a higher potential impact.

4. Various parameters in GRIB2 Code tables 4.2 and 4.3

Add entries to GRIB2 Code tables 4.2:

Product Discipline	Parameter Category	Parameter number	Parameter	Units
0	191	3	Days since last observation	d
10	2	10	Zonal vector component of vertically integrated ice internal pressure	Pa m
10	2	11	Meridional vector component of vertically integrated ice internal pressure	Pa m
10	2	12	Compressive ice strength	N m^{-1}
10	191	3	Days since last observation	d

Add entries to GRIB2 Code tables 4.3:

Code table 4.3 – Type of generating process

Code figure	Meaning
12	Post-processed analysis (see Note)
13	Post-processed forecast (see Note)

Note: Code figures 12 and 13 are intended in cases where code figures 0 and 2 may not be sufficient to indicate that significant post-processing has taken place on an initial analysis or forecast output.

5. Various parameters in GRIB2 Code tables 4.2 and 4.5

Add an entry to GRIB2 Code table 4.2:

Product Discipline	Parameter Category	Parameter number	Parameter	Units
1	0	7	Discharge from rivers or streams	m^3 s^{-1}

Add an entry to GRIB2 Code table 4.5:

Code figure	Meaning	Unit
167	Bottom of root zone	–

[Manual on Codes, Volume I.2] Part B/BUFR (CREX)

Editorial notes:
(1) Partial amendments are indicated in red to differentiate existing (unchanged) texts, where necessary.

6. JCOMM requirements for the migration to Table Driven Code Forms

Add entries to BUFR/CREX Table B:

TABLE REFERENCE F X Y	ELEMENT NAME	BUFR				CREX		
		UNIT	SCALE	REF. VALUE	DATA WIDTH (Bits)	UNIT	SCALE	DATA WIDTH (Char)
0 01 115	Identifier of the cruise or mission under which the data were collected	CCITT IA5	0	0	160	Character	0	20
0 03 010	Method of sea/water current measurement	Code table	0	0	4	Code table	0	2
0 03 011	Method of depth calculation	Code table	0	0	2	Code table	0	1
0 03 012	Instrument type/sensor for dissolved oxygen measurement	Code table	0	0	4	Code table	0	2
0 22 188	Dissolved oxygen	μmol kg^{-1}	3	0	19	μmol kg^{-1}	3	6

Modify the existing descriptor 0 22 067:

TABLE REFERENCE F X Y	ELEMENT NAME	BUFR				CREX		
		UNIT	SCALE	REF. VALUE	DATA WIDTH (Bits)	UNIT	SCALE	DATA WIDTH (Char)
0 22 067	Instrument type for water temperature/salinity profile measurement	Code table	0	0	10	Code table	0	4

Add entries to BUFR Table D:

TABLE REFERENCE	TABLE REFERENCES	ELEMENT NAME	ELEMENT DESCRIPTION
F X Y			
		(Sequence for representation of moored buoy identification)	
3 01 126	0 01 087	WMO marine observing platform extended identifier	
	0 01 015	Station or site name	
	0 02 149	Type of data buoy	
	3 01 011	Year, month, day	
	3 01 012	Hour, minute	
	3 01 021	Latitude/longitude (high accuracy)	
		(Sequence for representation of ancillary meteorological observations)	
3 02 091	0 20 001	Horizontal visibility	
	0 04 024	Time period or displacement	
	0 13 011	Total precipitation/total water equivalent	
		(Surface salinity)	
3 06 033	0 02 033	Method of salinity/depth measurement	
	0 07 063	Depth below sea/water surface (cm)	
	0 22 064	Salinity	
		(Surface current)	
3 06 034	0 02 031	Duration and time of current measurement	
	0 03 010	Method of sea/water current measurement	
	0 02 040	Method of removing velocity and motion of platform from	

		current	
	0 22 005	Direction of sea-surface current	
	0 22 032	Speed of sea-surface current	
		(Temperature and salinity profile)	
3 06 035	1 12 000	Delayed replication of 12 descriptors	
	0 31 002	Extended delayed descriptor replication factor	
	0 07 062	Depth below sea/water surface	In meter
	0 08 080	Qualifier for GTSPP quality flag	= 13 Depth at a level
	0 33 050	Global GTSPP quality flag	
	0 07 065	Water pressure	
	0 08 080	Qualifier for GTSPP quality flag	= 10 Pressure at a level
	0 33 050	Global GTSPP quality flag	
	0 22 043	Sea/water temperature	
	0 08 080	Qualifier for GTSPP quality flag	= 11 Temperature at a level
	0 33 050	Global GTSPP quality flag	
	0 22 064	Salinity	= 12 Salinity at a level
	0 08 080	Qualifier for GTSPP quality flag	
	0 33 050	Global GTSPP quality flag	
		(Current profile)	
3 06 036	1 12 000	Delayed replication of 12 descriptors	
	0 31 002	Extended delayed descriptor replication factor	
	0 07 062	Depth below sea/water surface	In meter
	0 08 080	Qualifier for GTSPP quality flag	= 13 Depth at a level
	0 33 050	Global GTSPP quality flag	
	0 07 065	Water pressure	
	0 08 080	Qualifier for GTSPP quality flag	= 10 Pressure at a level
	0 33 050	Global GTSPP quality flag	
	0 22 031	Speed of current	
	0 08 080	Qualifier for GTSPP quality flag	= 14 Current speed at a level
	0 33 050	Global GTSPP quality flag	
	0 22 004	Direction of current	
	0 08 080	Qualifier for GTSPP quality flag	= 15 Current direction at a level
	0 33 050	Global GTSPP quality flag	
		(Dissolved oxygen profile data)	
3 06 037	1 09 000	Delayed replication of 9 descriptors	
	0 31 002	Extended delayed descriptor replication factor	
	0 07 062	Depth below sea / water surface	
	0 08 080	Qualifier for GTSPP quality flag	= 13 Depth at a level
	0 33 050	Global GTSPP quality flag	
	0 07 065	Water pressure	
	0 08 080	Qualifier for GTSPP quality flag	= 10 Pressure at a level
	0 33 050	Global GTSPP quality flag	
	0 22 188	Dissolved oxygen	
	0 08 080	Qualifier for GTSPP quality flag	= 16 dissolved oxygen at a level
	0 33 050	GTSPP quality class	
		(Sequence for representation of standard surface marine meteorological observations from moored buoys)	
3 06 038	0 10 004	Pressure	
	0 10 051	Pressure reduced to mean sea level	
	0 07 033	Height of sensor above water surface	Height of air temperature/humidity sensor
	0 12 101	Temperature/air temperature	At observation height
	0 12 103	Dewpoint temperature	At observation height
	0 13 003	Relative humidity	With respect to water at all temperatures
	0 07 033	Height of sensor above water surface	Height of wind speed

			sensor
	0 08 021	Time significance	=2 Time averaged
	0 04 025	Time period or displacement	Period over which winds are averaged
	0 11 001	Wind direction	At observation height
	0 11 002	Wind speed	At observation height
	0 08 021	Time significance	Set to missing (cancel)
	0 04 025	Time period or displacement	Time period over which maximum gust observed
	0 11 041	Maximum wind gust speed	
	0 04 025	Time period or displacement	Set to missing (cancel)
	0 07 033	Height of sensor above water surface	Set to missing (cancel)
	0 02 005	Precision of temperature observation	
	0 07 063	Depth below sea/water surface (cm)	
	0 22 049	Sea-surface temperature	
		(Sequence for representation of basic wave measurements)	
3 06 039	0 22 078	Duration of wave record	
	0 22 070	Significant wave height	
	0 22 073	Maximum wave height	
	0 22 074	Average wave period	
	0 22 071	Spectral peak wave period	
	0 22 076	Direction from which dominant waves are coming	
	0 22 077	Directional spread of dominant wave	
		(Sequence for representation of detailed spectral wave measurements)	
3 06 040	0 22 078	Duration of wave record	
	0 22 082	Maximum non-directional spectral wave density	
	1 06 000	Delayed replication of 6 descriptors	
	0 31 001	Delayed descriptor replication factor	Number of frequency bins
	0 22 080	Waveband central frequency	
	0 22 069	Spectral wave density	
	0 22 086	Mean direction from which waves are coming	
	0 22 087	Principal direction from which waves are coming	
	0 22 088	First normalized polar coordinate from Fourier coefficients	
	0 22 089	Second normalized polar coordinate from Fourier coefficients	
		(Depth and temperature profile (high accuracy/ precision))	
3 06 041	0 02 032	Indicator for digitization	= 0 Fixed sensor depths
	1 02 000	Delayed replication of 2 descriptors	
	0 31 001	Delayed descriptor replication factor	Number of depths
	0 07 062	Depth below sea/water surface	
	0 22 043	Sea/water temperature	
		(Wind measurement from drifting buoy)	
3 06 042	0 02 169	Anemometer type	e.g. = 2 WOTAN, = 3 Sonic anemometer
	0 07 033	Height of sensor above water surface	Height of anemometer above water surface or effective height for WOTAN
	0 08 021	Time significance	= 2 Time averaged
	0 04 025	Time period or displacement	Averaging period in minutes
	0 11 001	Wind direction	At measurement height
	0 11 002	Wind speed	At measurement

			height
		(Sequence for representation of data derived from a ship based lowered instrument measuring subsurface seawater temperature, salinity and current profiles)	
3 15 007	3 01 003	Ship's call sign and motion	
		Extended identification	
	0 01 019	Long station or site name	
	0 01 103	IMO Number. Unique Lloyd's register	Values are restricted to between 0 and 9999999
	0 01 087	WMO marine observing platform extended identifier	Set to missing, if ship's call sign is reported.
		Cruise/ship line information	
	0 01 036	Agency in charge of operating the observing platform	
	0 01 115	Identifier of the cruise or mission under which the data were collected	Set to missing, if no cruise identifier is reported
	0 01 080	Ship line number according to SOOP	
	0 05 036	Ship transect number according to SOOP	
	3 01 011	Year, month, day	
	3 01 012	Hour, minute	
	3 01 021	Latitude/longitude (high accuracy)	
		Profile information	
	0 01 079	Unique identifier for the profile	
	0 01 023	Observation sequence number	Cast/station number along the line/transect
	0 22 063	Total water depth	
		Surface pressure	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 02 001	Pressure and 3-hour pressure change	
		Waves	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 02 021	Waves	
		Temperature and humidity data	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 02 052	Ship temperature and humidity data	
		Wind data	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 02 059	Ship wind data	
		Surface temperature, salinity and current	
	0 22 067	Instrument type for water temperature/salinity profile measurement	
	0 02 171	Instrument serial number for water temperature profile measurement	
	3 02 090	Sea/water temperature high precision	Surface temperature

	3 06 033	Surface salinity	
	3 06 034	Surface current	
	0 02 171	Instrument serial number for water temperature profile measurement	Set to missing (cancel)
	0 22 067	Instrument type for water temperature/salinity profile measurement	Set to missing (cancel)
		Temperature and salinity profile data	
	0 02 038	Method of water temperature and/or salinity measurement	
	0 22 067	Instrument type for water temperature/salinity profile measurement	
	0 22 068	Water temperature profile recorder types	
	0 02 171	Instrument serial number for water temperature profile measurement	
	0 02 033	Method of salinity/depth measurement	
	0 02 032	Indicator for digitization	
	0 22 056	Direction of profile	
	0 03 011	Method of depth calculation	
	3 06 035	Temperature and salinity profile	
		Current profile data	
	1 07 000	Delayed replication of 7 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 02 032	Indicator for digitization	
	0 03 010	Method of sea/water current measurement	
	0 02 031	Duration and time of current measurement	
	0 02 040	Method of removing velocity and motion of platform from current	
	0 22 056	Direction of profile	
	0 03 011	Method of depth calculation	
	3 06 036	Current profile	
		Dissolved oxygen profile data	
	1 04 000	Delayed replication of 4 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 02 032	Indicator for digitization	
	0 03 012	Instrument type/sensor for dissolved oxygen measurement	
	0 03 011	Method of depth calculation	
	3 06 037	Dissolved oxygen profile data	
		(Sequence for the representation of data from moored buoys)	
		Buoy identification and location	
3 15 008	3 01 126	Sequence for representation of moored buoy identification	
		Standard meteorological data	
	3 06 038	Sequence for representation of standard surface marine meteorological observations from moored buoys	For buoys equipped with more than 1 anemometer the height of sensor should relate to the one being used.
		Optional ancillary meteorological data	
	1 01 000	Delayed replication of 1 descriptor	

	0 31 000	Short delayed descriptor replication factor	
	3 02 091	Sequence for representation of ancillary meteorological observations	
		Optional radiation measurements	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 02 082	Radiation data	
		Optional basic wave measurements	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 06 039	Sequence for representation of basic wave measurements	
		Optional spectral wave measurements	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 06 040	Sequence for representation of detailed spectral wave measurements	
		Optional temperature profile measurements	
	1 02 000	Delayed replication of 2 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 02 005	Precision of temperature observation	
	3 06 041	Depth and temperature profile (high accuracy/precision)	
		Optional temperature and salinity profile measurements	
	1 02 000	Delayed replication of 2 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 02 005	Precision of temperature observation	
	3 06 004	Depth, temperature, salinity	
		Optional sub-surface current measurements	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 06 005	Sub-surface current measurements	
		(Sequence for the representation of data from drifting buoys)	
3 15 009	0 01 087	WMO marine observing platform extended identifier	
	0 01 019	Long station or site name	
	0 02 149	Type of data buoy	
		Time/date of last known position	
	0 08 021	Time significance	= 26 Time of last known position
	3 01 011	Year, month, day	Date of last known position
	3 01 012	Hour, minute	Time of last known position
		Location and location quality	
	3 01 021	Latitude/longitude (high accuracy)	
	2 08 016	Change width of CCITT IA5 field	Change to 16 characters

	0 01 051	Platform Transmitter ID number	
	2 08 000	Change width of CCITT IA5 field	Cancel
	0 02 148	Data collection and/or location system	= 1 Argos, = 8 Iridium and GPS, = 9 Argos-3
	0 01 012	Direction of motion of moving observing platform	Platform drift direction
	0 01 014	Platform drift speed (high precision)	Speed of motion of moving observing platform
	0 33 022	Quality of buoy satellite transmission	
	0 33 023	Quality of buoy location	
	0 33 027	Location quality class (range of radius of 66 % confidence)	
	0 25 026	Battery voltage (large range)	Platform battery voltage
		Drogue status	
	0 02 034	Drogue type	
	0 22 060	Lagrangian drifter drogue status	
	0 07 070	Drogue depth	
	0 02 190	Lagrangian drifter submergence (% time submerged)	
		Time/date of observation	
	0 08 021	Time significance	= 25 Nominal reporting time
	3 01 011	Year, month, day	Date of observation
	3 01 012	Hour, minute	Time of observation
		Surface temperature and salinity	
	0 02 005	Precision of temperature observation	
	0 22 043	Sea/water temperature	
	0 02 033	Method of salinity/depth measurement	
	0 22 059	Sea-surface salinity	
		Surface type/ice information	
	0 08 029	Surface type	
	0 13 115	Ice thickness	
		Optional temperature and salinity profile measurements	
	1 03 000	Delayed replication of 3 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 02 005	Precision of temperature observation	
	3 06 004	Depth, temperature, salinity	
	0 02 005	Precision of temperature observation	Set to missing (cancel)
		Pressure and air temperature data	
	0 10 004	Pressure	
	0 10 051	Pressure reduced to mean sea level	
	1 02 000	Delayed replication of 2 descriptors	
	0 31 000	Short delayed descriptor replication factor	
	0 07 033	Height of sensor above water surface	
	0 12 101	Temperature/air temperature	
		Wind data	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	

	3 06 042	Wind measurement from drifting buoy	
		Wave data	
	1 01 000	Delayed replication of 1 descriptor	
	0 31 000	Short delayed descriptor replication factor	
	3 06 039	Sequence for representation of basic wave measurements	

Modify an entry in code table associated with BUFR/CREX Table B:

0 02 149
Type of data buoy

Code figure	Meaning
4	Ice drifter

Add entries in code tables associated with BUFR/CREX Table B:

0 02 149
Type of data buoy

Code figure	Meaning
38	Ice beacon
39	Ice mass balance buoy

0 08 029
Surface type

Code figure	Meaning
18	Sea ice

0 08 080
Qualifier for GTSPP quality flag

Code figure	Meaning
14	sea/water current speed at a level
15	sea/water current direction at a level
16	dissolved oxygen at a level

0 22 067
Instrument type for water temperature/salinity profile measurement

Code figure	Meaning
902	Brooke Ocean Moving Vessel Profiler (MVP)
903	Seabird CTD
904	AML Oceanographic CTD
905	Falmouth Scientific CTD
906	Ocean Sensors CTD
907	Valeport CTD
908	Ocean Science MVP
909	Idronaut CTD
910	Seabird SBE38

0 33 027
Location quality class

Code figure	Meaning
4	<= 100m

Add code tables associated with BUFR/CREX Table B:

0 03 010
Method of sea/water current measurement

Code figure	Meaning
0	Reserved
1*	ADCP (Acoustic Doppler Current Profiler)
2	GEK (Geomagnetic ElectroKinetograph)
3	Ship's set and drift determined by fixes 3-6 hours apart
4	Ship's set and drift determined by fixes more than 6 hours but less than 12 hours apart

5	Drift of buoy
6	ADCP (Acoustic Doppler Current Profiler)
7	ADCP (Acoustic Doppler Current Profiler) bottom tracking mode
8	Electromagnetic sensor
9	Rotor and vane
10	Lowered ADCP
11 – 14	Reserved
15	Missing value

0 03 011

Method of depth calculation

Code figure	Meaning
0	Depth calculated using fall rate equation
1	Depth calculated from water pressure / equation of state
2	Reserved
3	Missing value

0 03 012

Instrument type/sensor for dissolved oxygen measurement

Code figure	Meaning
0	Anderraa oxygen Optode
1	Winkler bottle
2 – 14	Reserved
15	Missing value

7. Tide elevation data in BUFR/CREX

<u>Add entries to BUFR/CREX Table B</u>:

TABLE REFERENCE F X Y	ELEMENT NAME	BUFR				CREX		
		UNIT	SCALE	REF. VALUE	DATA WIDTH (Bits)	UNIT	SCALE	DATA WIDTH (Char.)
0 02 007	Type of sensor for water level measuring instrument	Code table	0	0	6	Code table	0	2
0 02 147	Method of transmission to collection centre	Code table	0	0	6	Code table	0	2
0 08 015	Significant qualifier for sensor	Code table	0	0	3	Code table	0	1
0 08 032	Status of operation	Code table	0	0	4	Code table	0	2
0 12 060	AWS enclosure internal temperature	K	1	0	12	°C	1	3

<u>Add entries to BUFR Table D</u>:

TABLE REFERENCE F X Y	TABLE REFERENCES	ELEMENT NAME	ELEMENT DESCRIPTION
		(Sequence for representation of tide station identification, method of transmission, time the message is transmitted and reference time for reports in a time series)	
3 06 011	3 01 021	Latitude/longitude (high accuracy)	
	0 01 075	Tide station identification	Alphanumeric ID (5 characters)
	0 02 147	Method of transmission to collection centre	
	3 01 011	Year, month, day	
	3 01 013	Hour, minute, second	
		(Sequence for representation of sensor type, significant qualifier for sensor and status of operation)	
3 06 012	0 02 007	Type of sensor for water level measuring instrument	

	0 08 015	Significant qualifier for sensor	
	0 08 032	Status of operation	
	3 06 029	Sequence for representation of sampling information for water levels in the time series report	
		(Sequence for representation of water level and residual in the time series)	
3 06 013	3 06 012	Sequence for representation of sensor type, significant qualifier for sensor and status of operation	
	3 01 011	Year, month, day	Reference date for the time series
	3 01 013	Hour, minute, second	Reference time for the time series
	0 22 120	Tide station automated water level check	
	0 22 121	Tide station manual water level check	
	0 04 015	Time increment	Added to reset the reference time
	0 04 065	Short time increment	Added to each data value in the time series
	1 02 000	Delayed replication of 2 descriptors	
	0 31 001	Delayed descriptor replication factor	
	0 22 038	Tidal elevation with respect to local chart datum	
	0 22 040	Meteorological residual tidal elevation (surge or offset)	
		(Sequence for representation of water level in the time series, similar to 306013 but with no residual)	
3 06 014	3 06 012	Sequence for representation of sensor type, significant qualifier for sensor and status of operation	
	3 01 011	Year, month, day	Reference date for the time series
	3 01 013	Hour, minute, second	Reference time for the time series
	0 22 120	Tide station automated water level check	
	0 22 121	Tide station manual water level check	
	0 04 015	Time increment	Added to reset the reference time
	0 04 065	Short time increment	Added to each data value in the time series
	1 01 000	Delayed replication of 1 descriptor	
	0 31 001	Delayed descriptor replication factor	
	0 22 038	Tidal elevation with respect to local chart datum	
3 06 016		(Sequence for representation of ancillary meteorological data associated with water level data)	
	3 01 011	Year, month, day	Reference date for the time series
	3 01 013	Hour, minute, second	Reference time for the time series
	0 10 004	Pressure	Station level
	0 10 051	Pressure reduced to mean sea level	
	3 02 032	Temperature and humidity data	
	0 07 032	Height of sensor above local ground (or deck of marine platform)	
	0 02 002	Type of instrumentation for wind measurement	
	0 08 021	Time significance	= 2 Time averaged
	0 04 025	Time period or displacement	E.g. = 1 for 1-minute, = 10 for 10-minute
	0 11 001	Wind direction	
	0 11 002	Wind speed	
	0 04 025	Time period or displacement	In minutes
	0 11 043	Maximum wind gust direction	
	0 11 041	Maximum wind gust speed	

	0 25 026	Battery voltage (large range)	AWS battery voltage
	0 12 060	AWS enclosure internal temperature	
		(Sequence for representation of sampling information for water levels in the time series report)	
3 06 029	0 25 170	Sampling interval (time)	Seconds
	0 25 171	Sample averaging period	Seconds
	0 25 172	Number of samples	

Add Code tables associated with BUFR/CREX Table B:

0 02 007
Type of sensor for water level measuring instrument

Code figure	
0	Reserved
1	Shaft encoder float system
2	Ultrasonic
3	Radar
4	Pressure (single transducer)
5	Pressure (multiple transducer)
6	Pressure (in stilling well)
7	Bubbler pressure
8	Acoustic (with sounding tube)
9	Acoustic (in open air)
10-62	Reserved
63	Missing value

0 02 147
Method of transmission to collection centre

Code figure	
0	Reserved
1	Direct leased circuit
2	Dialled up connection
3	Internet ISP
4	DCP via Satellite (MTSAT, METEOSAT, etc.)
5	VSAT
6	GAN, BGAN
7	Thiss terminal
8	Iridium satellites
9	Mobile telephony
10-62	Reserved
63	Missing value

0 08 015
Significant qualifier for sensor

Code figure	
0	Single sensor
1	Primary sensor
2	Secondary sensor (Backup)
3-6	Reserved
7	Missing value

0 08 032
Status of operation

Code figure	
0	Routine operation
1	Event triggered by storm surge
2	Event triggered tsunami

3	Event Triggered manually
4	Installation testing
5	Maintenance testing
6-14	Reserved
15	Missing value

8. Identifiers of agency operating observing platform

Add entries to Code table associated with BUFR/CREX Table B:

0 01 036
Agency in charge of operating the observing platform

Code figure	
124173	Canada, Environment Canada
124174	Canada, Department of National Defense
124175	Canada, Nav Canada

9. Identifiers of balloon manufacturer

Add entries to Code table associated with BUFR/CREX Table B:

0 02 080
Balloon manufacturer

Code figure	
3	Guangzhou Shuangyi (China)
4	ChemChina Zhuzhou (China)

10. Various parameters for satellite observations

Add entries to BUFR Flag tables:

Flag table 0 33 032 (Channel quality flags for ATOVS)

7	Quality for this scan is reduced

Flag table 0 33 083 (Radiance data quality flags)

6	Pixel is affected by radio frequency interference

[Manual on Codes, Volume I.2] Part C/Common Code tables

11. Amendments to Common Code table C–2

Amend the existing entry 84/84 (currently "Vacant") and 84/184 (currently "Not vacant") in Common Code table C–2:

Date of assignment of number (necessary after 30/06/2007)	Code figure for $r_a r_a$ (Code table 3685)	Code figure for BUFR (Code table 0 02 011)

Before	84	84	Sippican MARK II with chip thermistor, carbon element and derived pressure from GPS height
Needed	84	184	Vacant

12. New identifier for radiosonde of Switzerland

Amend the existing entry 26/126 "Not vacant" in Common Code table C–2:

Date of assignment of number (necessary after 30/06/2007)	Code figure for $r_a r_a$ (Code table 3685)	Code figure for BUFR (Code table 0 02 011)	
(07/05/2014)	26	126	Meteolabor SRS–C34/Argus 37 (Switzerland)

13. New identifier for radiosonde of Japan

Add an entry to Common Code table C–2:

Date of assignment of number (necessary after 30/06/2007)	Code figure for $r_a r_a$ (Code table 3685)	Code figure for BUFR (Code table 0 02 011)	
(07/05/2014)	35	135	Meisei iMS-100 GPS radiosonde w/thermistor sensor, capacitance relative humidity sensor, and derived pressure from GPS height (Japan)

14. New identifiers for radiosondes of China

Add entries to Common Code table C–2:

Date of assignment of number (necessary after 30/06/2007)	Code figure for $r_a r_a$ (Code table 3685)	Code figure for BUFR (Code table 0 02 011)	
07/05/2014	43	143	NanJing Daqiao XGP-3G (China) *
07/05/2014	44	144	TianJin HuaYunTianYi GTS(U)1 (China) *
07/05/2014	45	145	Beijing Changfeng CF-06 (China) *
07/05/2014	46	146	Shanghai Changwang GTS3 (China) *

* All GPS radiosondes are with thermistor, silicon piezoresistive pressure sensor or pressure derived from GPS height, capacitive relative humidity sensor and wind derived from GPS height.

15. New identifiers for satellite of Japan

Add entries to Common Code table C–5:

Code figure for $I_6 I_6 I_6$	Code figure for BUFR (Code table 0 01 007)	Code figure for GRIB Edition 2	
153	153	153	GMS
154	154	154	GMS-2

16. New sub-centres of RSMC Wellington

Add entries to Common Code table C–12:

ORIGINATING CENTRES C–1, C–11 or C–12		SUB-CENTRES BUFR 0 01 034 BUFR Edition 3, Octet 5 in Section 1 BUFR Edition 4, Octets 7–8 in Section 1 GRIB Edition 1, Octet 26 in Section 1 GRIB Edition 2, Octets 8–9 in Section 1 CREX Edition 2, ppp in Group Pooooopppp in Section 1	
Code figure	Name	Code figure	Name
69	Wellington (RSMC)	204	National Institute of Water and Atmospheric Research (NIWA – New Zealand)
		205	Niue
		206	Rarotonga (Cook Islands)
		207	Apia (Samoa)
		208	Tonga
		209	Tuvalu
		210	Kiribati
		211	Tokelau

17. New sub-centre of Brazil

Add an entry to Common Code table C–12:

ORIGINATING CENTRES C–1, C–11 or C–12		SUB-CENTRES BUFR 0 01 034 BUFR Edition 3, Octet 5 in Section 1 BUFR Edition 4, Octets 7–8 in Section 1 GRIB Edition 1, Octet 26 in Section 1 GRIB Edition 2, Octets 8–9 in Section 1 CREX Edition 2, ppp in Group Pooooopppp in Section 1	
Code figure	Name	Code figure	Name
46	Brazilian Space Agency – INPE	25	São Paulo University – USP

18. New sub-centre of Melbourne

Add an entry to Common Code table C–12:

ORIGINATING CENTRES C–1, C–11 or C–12		SUB-CENTRES BUFR 0 01 034 BUFR Edition 3, Octet 5 in Section 1 BUFR Edition 4, Octets 7–8 in Section 1 GRIB Edition 1, Octet 26 in Section 1 GRIB Edition 2, Octets 8–9 in Section 1 CREX Edition 2, ppp in Group Pooooopppp in Section 1	
Code figure	Name	Code figure	Name
2	Melbourne	210	Alice Springs

19. New sub-centre by France

Add an entry to Common Code table C–12:

ORIGINATING CENTRES C–1, C–11 or C–12		SUB-CENTRES BUFR 0 01 034 BUFR Edition 3, Octet 5 in Section 1 BUFR Edition 4, Octets 7–8 in Section 1 GRIB Edition 1, Octet 26 in Section 1 GRIB Edition 2, Octets 8–9 in Section 1 CREX Edition 2, ppp in Group Pooooppp in Section 1	
Code figure	Name	Code figure	Name
85	Toulouse (RSMC)	200	Institut National de l'Environnement Industriel et des Risques (France)
		201	Rheinisches Institut für Umweltforschung an der Universität zu Köln E.V. (Germany)
191	French Polynesia (NMC)	1	RARS station of Tahiti (French Polynesia)