PROPOSED BUFR TEMPLATE FOR BUOY AND WAVE DATA *(not validated)*

Proposed template is listed below. Descriptors number 1 to 84 in the table correspond to the existing BUFR template for buoy data.

Descriptors used are from BUFR Master table 0, version 11. No local table is being used.

- Are indicated in red descriptors that are presently being used for BUFR encoding of PDE buoy data
- Are indicated in blue descriptors that are similar to those being used for BUFR encoding of PDE buoy data (i.e. another way to code the same information is proposed)
- Are indicated in green, information which will have to be encoded for PDE buoys if the information is available (i.e. will be useful or required by users)
- ***New proposed descriptors for BUFR template for buoy data are indicated in bold and italic. They correspond to descriptors 85 and after.***

Implication for PDE (Puertos Del Estado, Spain) buoys:

- Buoy WMO identification number to be coded and divided in 3 descriptors instead of 1 (i.e. 001003, 001020, and 001005).
- Buoy position to be coded in high accuracy instead of coarse accuracy.
- Air pressure reduced to sea level (MSLP) must be computed and encoded.
- Sensor height with regard to platform deck and average sea level will have to be encoded for air temperature and wind; wind is assumed to be corrected to 10m so this will have to be indicated in the reports (i.e. 008082 coded 1, and 007033 coded for 10m).
- Fields for which information is not available will be coded with “missing”.
- Section 1 of existing PDE BUFR reports was not encoded according to existing regulations:
    - Local table version should be coded 0 (not 1) as all descriptors being used are formal WMO descriptors (i.e. no PDE local descriptors are being used).
    - Current B§UFR table version is 11 (not 1)
    - Year should be coded as following: YYYY coded (YYYY-100*(Century-1)), e.g. 2005 coded 05.

Proposed new template for buoy data, including directional and non-directional wave data

#	Descriptor	Name	Expanded descriptors	Comment, encoding
1	001003	WMO region	001003	First digit of WMO number (e.g. 62024 => 6)
2	001020	WMO region sub-area	001020	Second digit of WMO number (e.g. 62024 => 2)
3	001005	Buoy/platform identifier	001005	Last 3 digits of WMO number (e.g. 62024 => 024)
4	002001	Type of station	002001	1=Manned station
5	002036	Buoy type	002036	1=Fixed buoy
6	002149	Type of data buoy	002149	16=unspecified moored buoy 24=Omnidirectional waverider 25=Directional waverider
7	301011	Date	004001 (year) 004002 (month) 004003 (day)	Date of observation
8	301012	Time	004004 (Hour) 004005 (Minutes)	Time of observation
9	008021	Time significance	008021	Value = 26 (time of last known position)
10	301011	Date	004001 (year) 004002 (month) 004003 (day)	Date of last known position coded here; coded missing for fixed station
11	301012	Time	004004 (Hour) 004005 (Minutes)	Time of last known position coded here; coded missing for fixed station
12	008021	Time significance	008021	Value = “missing”
13	301021	Latitude and longitude (high accuracy)	005001 (Lat; high accuracy) 006001 (Lon; high accuracy)	Coarse accuracy descriptors (005002 and 006002 respectively) were used with PDE buoys
14	027004	Alternate latitude (high accuracy)	027004	Coded if Argos is used for location; otherwise coded missing
15	028004	Alternate longitude (high accuracy)	028004	Coded if Argos is used for location; otherwise coded missing
16	007030	Height of station above MSL	007030	
17	001051	Platform Transmitter ID	001051	If Argos is used, Argos ID number;
18	002148	Data collection and/or Location system	002148	1=Argos 2=GPS Coded missing if none
19	001012	Platform drift direction	001012	Coded missing for moored buoys
20	001014	Platform drift speed	001014	Coded missing for moored buoys
21	002040	Method of removing platform direction and speed from current	002040	Coded missing for moored buoys
22	033022	Quality of buoy satellite transmission	033022	0=Good 1=Dubious 3=missing
23	033023	Quality of buoy location	033023	0=Reliable 1=Last known position 2=Dubious 3=missinh
24	033027	Location quality class (range of radius of 66% confidence)	033027	0: >= 1500m 1: 500m to 1500m
25	022063	Total water depth	022063	Mooring depth; otherwise coded missing
26	302021	Waves	022001 (direction of waves)	

			022011 (period of waves) 022021 (height of waves)	
27	302022	Wind waves	022002 (direction wind wv) 022012 (period wind wv) 022022 (height wind wv)	
28	302023	Swell waves	022003 (direction swell wv) 022013 (period swell wv) 022023 (height swell wv)	
29	008081	Type of equipment (observing platform)	008081	(New descriptor, scale=0, ref=0, bits=6) 0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value=3: Equipment = “platform”
30	025026	Battery voltage	025026	(New descriptor, Volts, scale=0, ref=0, bits=6) Platform battery voltage
31	008081	Type of equipment (transmitter)	008081	(New descriptor, scale=0, ref=0, bits=6) 0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value=1: Equipment = “transmitter”
32	025026	Battery voltage	025026	(New descriptor, Volts, scale=0, ref=0, bits=6) Transmitter battery voltage
33	008081	Type of equipment (receiver)	008081	(New descriptor, scale=0, ref=0, bits=6) 0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value=2: Equipment = “receiver”
34	025026	Battery voltage	025026	(New descriptor, Volts, scale=0, ref=0, bits=6) Receiver battery voltage
35	008081	Type of equipment – value Missing = cancel	008081	0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value = “missing”
36	002034	Drogue type	002034	Coded missing for moored buoys
37	022060	Lagrangian drifter drogue status	022060	(New descriptor, scale=0, ref=0, bits=3) 0=detached 1=attached 3=missing Coded missing for moored buoys
38	007070	Drogue depth	007070	Coded missing for moored buoys
39	002190	Lagrangian drifter submergence	002190	Coded missing for moored buoys
40	025086	Depth correction indicator for sub-surface measurements along cable	025086	0=depths are not corrected 1=depths are corrected 3=missing
41	002035	Cable length	002035	Depth of hydrostatic pressure sensor at bottom of cable
42	002168	Hydrostatic pressure of lower end of cable	002168	

43	020031	Ice deposit (thickness)	020031	Ice thickness
44	002038	Method of temperature and/or velocity measurement	002038	e.g. 2=hull contact sensor 8=thermistor chain
45	306004	Digitization, depth/salinity method, depths/salinities/temperatures	002032 (indicator for digit) 002033 (method sal/depth) 103000 (delayed repl 3 desc) 031001 (replication factor) 007062 (depth) 022043 (sea temperature) 022062 (salinity)	Replication factor indicates number of (depth, temp., salinity) data points that are encoded
46	002030	Method of current measurement	002030	
47	306005	Time/duration of current measurement, depths/directions/speeds	002031 (method current) 103000 (delayed repl 3 desc) 031001 (replicationfactor) 007062 (depth) 022004 (direction current) 022031 (speed current)	Replication factor indicates number of (pepth, dir, speed) data points that are encoded
48	007031	Height of barometer above MSL	007031	
49	008081	Type of equipment (sensor)	008081	(New descriptor, scale=0, ref=0, bits=6) 0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value=0: Equipment = “sensor”
50	012064	Instrument temperature	012064	Temperature of air pressure sensor
51	302001	Pressure and pressure change	010004 (pressure at station) 010051 (MSLP) 010061 (3-hour tendency) 010063 (tend. Characteristic)	Mean Seal Level Pressure to be computed based upon pressure at station level and sensor height
52	008081	Type of equipment – value missing = cancel	008081	(New descriptor, scale=0, ref=0, bits=6) 0=sensor 1=transmitter 2=receiver 3=observing system Here coded with value = “missing”
53	007032	Height of sensor above marine deck platform (for temp.&hum. measurement)	007032	Height of thermometer above marine desck
54	007033	Height of sensor above water surface (for temp.&hum. measurement)	007033	Height of thermometer (assumed should be coded with value = 2 metres for PDE buoys)
55	012101	Dry-bulb temperature (scale 2)	012101	Dry-bulb temperature at 2m (012004) was used for PDE buoys
56	012103	Dew-point temperature (scale 2)	012103	
57	013003	Relative humidity	013003	
58	007032	Height of sensor above marine deck platform (for wind measurement)	007032	Real height of anemometer above marine deck
59	007033	Height of sensor above water surface (for wind measurement)	007033	Real height of anemometer above average water surface
60	008082	Artificial correction of sensor height to another value	008082	(New descriptor, scale=0, ref=0, bits=6) 0=sensor height is not corrected 1=sensor height is artificially corrected

				7=missing Assumed should be coded to value 1 for PDE buoys
61	007033	Height of sensor above water surface (here height of anemometer to which it is artificially corrected)	007033	Here height of anemometer to which it is artificially corrected Assumed should be coded with value = 10 metres for PDE buoys
62	002169	Anemometer type	002169	e.g. 0=rotor 1=propeller rotor
63	002002	Type of instrumentation for wind measurement	002002	
64	008021	Time significance	008021	Value = 2 (time averaged)
65	004025	Time period in minutes	004025	Value for averaging period (e.g. 10 minutes)
66	011001	Wind direction	011001	Wind direction at 10m (011011) was used with PDE buoys
67	011002	Wind speed	011002	Wind speed at 10m (011012) was used with PDE buoys
68	008021	Time significance	008021	Value = 23 (monitoring period)
69	004025	Time period in minutes	004025	Period during which gust is being monitored prior to observation time
70	011043	Maximum wind gust direction	011043	
71	011041	Maximum wind gust speed	011041	
72	008082	Artificial correction of sensor height to another value (set to missing to reset previous value)	008082	(New descriptor, scale=0, ref=0, bits=6) 0=sensor height is not corrected 1=sensor height is artificially corrected 7=missing Here coded with value = “missing”
73	007033	Height of sensor above water surface (set to missing to cancel previous value)	007033	Value=”missing”: Redefine height to previous level
74	007032	Height of sensor above marine deck platform (for precipitation measurement)	007032	Here height of precipitations
75	004024	Time period in hours	004024	Period during which precipitation is being monitored prior to observation time
76	013011	Total precipitation	013011	Total precipitation during monitoring period
77	007032	Height of sensor above marine deck platform (set to missing to cancel the previous value)	007032	Value = “missing”
78	008021	Time significance	008021	Value = 3 (accumulated)
79	004024	Time period in hours	004024	Period during which global radiation is being accumulated prior to observation time
80	014021	Global radiation, integrated over period specified	014021	
81	008021	Time significance	008021	Value = “missing”
82	025028	Operator or manufacturer defined parameter (#1)	025028	(New descriptor, scale=1, ref=-16384, bits=15) Housekeeping parameter number 1
83	025028	Operator or manufacturer defined parameter (#2)	025028	(New descriptor, scale=1, ref=-16384, bits=15) Housekeeping parameter number 2
84	025028	Operator or manufacturer defined parameter (#3)	025028	(New descriptor, scale=1, ref=-16384, bits=15) Housekeeping parameter number 3
85	***022073***	***Maximum wave height***	***022073***	
86	***022070***	***Significant wave height***	***022070***	***$H_sH_sH_sH_s$ in WAVEOB section 0***
87	***022074***	***Average wave period***	***022074***	***$P_aP_aP_aP_a$ in WAVEOB section 0***
88	***022076***	***Direction from which dominant waves are coming***	***022076***	***d_dd_d in WAVEOB section 0***
89	***022077***	***Directional spread of dominant waves***	***022077***	***d_sd_s in WAVEOB section 0***

90	*022071*	*Spectral peak wave period*	*022071*	*$P_pP_pP_pP_p$ in WAVEOB section 0*
91	*022078*	*Duration of wave record*	*022078*	*D'D'D'D' in WAVEOB section 1*
92	*022082*	*Maximum non-directional spectral wave density*	*022082*	*$C_mC_mC_m$ in WAVEOB section 2*
93	*022084*	*Band containing maximum non-directional spectral wave density*	*022084*	*n_mn_m in WAVEOB section 2*
94	*025043*	*Wave sampling interval (time)*	*025043*	*SSSS in WAVEOB (I_a=0)*
95	*025044*	*Wave sampling interval (space)*	*025044*	*SSSS in WAVEOB (I_a=1)*
96	*112000*	*Delayed replication of 12 descriptors*	*112000*	*Replication for frequency bands. PDE buoys did not used delayed replication*
97	*031001*	*Replication factor*	*031001*	*Delayed replication therefore added. Replication factor = Number of frequency bands*
98	*022080*	*Waveband central frequency*	*022080*	*$f_nf_nf_n$ in WAVEOB section 1*
99	*201134*	*Add 6 bits to data width*	*201134*	
100	*022096*	*Spectral band width*	*022096*	*Here coded with 10 bits as descriptor requires 4 bits and we have 6 bits added due to previous operation descriptor*
101	*201000*	*Reset data width to normal*	*201000*	
102	*022090*	*Non-directional spectral estimate by wave frequency*	*022090*	*$A_nA_nA_n$ in WAVEOB (I_b=0) section 5*
103	*022086*	*Mean direction from which waves are coming*	*022086*	*$d_{a1}d_{a1}$ in WAVEOB section 4*
104	*022087*	*Principal direction from which waves are coming*	*022087*	*$d_{a2}d_{a2}$ in WAVEOB section 4*
105	*022095*	*Directional spread of individual waves*	*022095*	
106	*022085*	*Spectral wave density ratio*	*022085*	*c_nc_n in WAVEOB section 2*
107	*022088*	*First normalized polar coordinate from Fourier cœfficients*	*022088*	*r_1r_1 in WAVEOB section 4*
108	*022089*	*Second normalized polar coordinate from Fourier coefficients*	*022089*	*r_2r_2 in WAVEOB section 4*
109	*022092*	*Directional spectral estimate by wave frequency*	*022092*	*$A_nA_nA_n$ in WAVEOB (I_b=1) section 5*