WMO GRIB3 Code Tables

Table of Contents

Content of Sections in GRIB edition 3

Section 0 - Indicator Section

Byte No.	Content
1–4	GRIB (coded according to the International Alphabet No. 5)
5–6	Reserved
7	Master tables version number (see Code Table 0.0 and Note 1–3 in Section 1)
8	Edition number (3)
9–16	Total length of GRIB message in bytes (including Section 0)

Section 1 - Originator Section

Byte No.	Content
1–4	Length of section in bytes
5	Number of section (1)
6–7	Identification of originating/generating centre (see Common Code Table C–11)
8–9	Identification of originating/generating subcentre (allocated by originating/generating centre)
10	Local tables version number (see Code Table 1.0 and Notes 1-3)
11	Identification of Project (see Code Table 1.1)
12	Production status of processed data in this GRIB message (see Code Table 1.2)
13–14	Originator Local template number (see Notes 4 and 5)
15–16	Length of originator local template in bytes (see Note 5)
17–nn	Originator Local template (see Note 6)
(nn+1)–(nn+2)	Project Local template number (see Notes 7 and 8)
(nn+3)–(nn+4)	Length of project local template in bytes (see Note 8)

Byte No.	Content
(nn+5)–mm	Project Local template (see Note 9)

Notes:

1. Local tables shall define those parts of the Master table that are reserved for local use except for the case described in note (2). In any case, the use of Local tables in messages intended for non-local or international exchange is strongly discouraged.
2. If master tables version number is 255 then only local tables are in use. The local tables version number must not be zero nor missing, and local tables may include entries from the entire range of the tables.
3. If local tables version number is zero, master tables version number shall not be zero or missing and only those parts of the tables not reserved for local use may be used.
4. Originator Local templates are defined and maintained by the Originating Centre.
5. Originator Local template is optional. If local template is not present, the originator local template number shall be set to missing (all bits set to 1) and the length of local template shall be set to zero.
6. Originator local template shall be selected using the originator local template number. The originator local templates are maintained and made available to the users by the originating centre.
7. Project Local templates are defined and maintained by the Originating Centre.
8. Project Local template is optional. If local template is not present, the project local template number shall be set to missing (all bits set to 1) and the length of project local template shall be set to zero.
9. Project local template shall be selected using the project local template number. The project local templates are maintained and made available to the users by the project participants.

Section 2 - Repetitions and Index Section

Byte No.	Content
1–4	Length of section in bytes
5	Number of section (2)
6–7	Total number of repetitions (or total number of fields) (see Note 1)
8–9	Number of distinct sections 3 with length greater than 7 bytes (see Notes 1 and 2)
10–11	Number of distinct sections 4 with length greater than 7 bytes (see Notes 1 and 2)
12–13	Number of distinct sections 5 with length greater than 7 bytes (see Notes 1 and 2)

Byte No.	Content
14–15	Number of distinct sections 6 with length greater than 7 bytes (see Notes 1 and 2)
16–17	Number of distinct sections 7 with length greater than 7 bytes (see Notes 1 and 2)
18–19	Number of distinct sections 8 with length greater than 7 bytes (see Notes 1 and 2)
20–21	Number of distinct sections 9 with length greater than 7 bytes (see Notes 1 and 2)
22–23	Index template number
24–27	Length of Index template in bytes
28–nn	Index template (See Note 3) (see template 2.N where N is the Index template number given in bytes 22-23)

Notes:

1. A message with only one field shall have the total number of repetitions and each of the number of distinct sections set to 1.
2. Two repeated sections shall never be identical. If two sections are identical because they have the same content, one of the two shall be coded with only 7 bytes (empty section with reference) and the SUI shall be coded with the same value of the identical section to which this section refers. Each section will therefore have content in it or refer to another section of the same section number. In the latter case, it will be made only of 7 bytes comprising section length (4 bytes), number of section (1 byte) and Section Unique Identifier - SUI (2 bytes).
3. The inclusion of an Index template is optional. If index template is not present, the index template number (bytes 21-22) shall be set to missing (all bits set to 1) and the length of index template (bytes 23-26) shall be set to zero.

Section 3 - Time Domain Section

Byte No.	Content
1-4	Length of section in bytes (7 or nn)
5	Number of section (3)
6-7	Section Unique Identifier (SUI)
8	Significance of reference date and time (see Code Table 3.0)
9	Type of Calendar (code table 3.1) (see Note 1)
10-13	Year (signed integer according to Reg. 92.1.5)
14	Month
15	Day

Byte No.	Content
16	Hour
17	Minute
18	Second
19-20	Time Domain Template number (see code Table 3.2)
21-nn	Time Domain Template (see template 3.N where N is the Time Domain Template number given in bytes 19-20)

Note:

1. The type of calendar used (byte 9) applies to the entire section including the Time Domain Template.

Section 4 – Horizontal Domain Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (4)
6-7	Section Unique Identifier (SUI)
8–11	Number of points in the domain
12–13	Horizontal Domain Template number (see Code Table 4.0)
14–nn	Horizontal Domain Template (see Template 4.N where N is the Horizontal Grid Template number given in bytes 12-13)

Section 5 –Vertical Domain Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (5)
6-7	Section Unique Identifier (SUI)
8–9	Vertical Domain Template number (see Code Table 5.0)
10–nn	Vertical Domain Template (see Template 5.N where N is the Vertical Domain Template number given in bytes 8-9)

Section 6 – Generating Process Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (6)
6-7	Section Unique Identifier (SUI)
8-9	Generating Process Template number (see Code Table 6.0)
10-nn	Generating Process Template (see Template 6.N where N is the Generating Process Template number given in bytes 8-9)

Section 7 – Observable Property Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (7)
6-7	Section Unique Identifier (SUI)
8-9	Observable Property Template number (see Code Table 7.0)
10–nn	Observable Property Template (see Template 7.N where N is the Observable Property Template number given in bytes 8-9)

Section 8 – Data Representation Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (8)
6-7	Section Unique Identifier (SUI)
8-11	Number of data values encoded in Section 10.
12–13	Data Representation Template number (see Code Table 8.0)
14–nn	Data Representation Template (see Template 8.N where N is the Data Representation Template number given in bytes 12-13)

Section 9 – Overlay Section

Byte No.	Contents
1–4	Length of section in bytes (7 or nn)
5	Number of section (9)
6-7	Section Unique Identifier (SUI)
8–9	Overlay Template number (see Code Table 9.0)
10–nn	Overlay Template (see Template 9.N where N is the Overlay Template number given in bytes 8-9)

Section 10 – Data Section

Byte No.	Contents
1–4	Length of section in bytes (nn)
5	Number of section (10)
6–nn	Data in a format described by Data Template 10.X where X is the Data Template number given in bytes 12–13 of Section 8.

Section 11 – End Section

Byte No.	Contents
1–4	“7777” (coded according to the International Alphabet No. 5)

Code Tables in GRIB Edition 3

Code Tables used in Section 0 (Indicator Section)

Code Table 0.0 – GRIB master tables version number

Code figure	Meaning
0	Experimental
1–254	Future versions
255	Missing. Local tables in use. Valid local tables version number shall be coded.

Code Tables used in Section 1 (Originator Section)

Code Table 1.0 – GRIB local tables version number

Code figure	Meaning
0	Local tables not used. Only table entries and templates from the current master table are valid
1–254	Local tables versions used
255	Missing

Code Table 1.1 – International Projects

Code figure	Meaning
0	Reserved
1	THORPEX Interactive Grand Global Ensemble (TIGGE)
2	Subseasonal-to-Seasonal prediction (S2S)
3–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 1.2 – Production status of data

Code figure	Meaning
0	Operational products
1	Operational test products
2	Research products
3–191	Reserved
192–254	Reserved for local use
255	Missing

Code Tables used in Section 3 (Time Domain Section)

Code Table 3.0 – Significance of reference date and time

Code figure	Meaning
0	Analysis
1	Start of forecast
2	Verifying time of forecast
3	Observation time
4–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 3.1 – Type of calendar

Code figure	Meaning
0	Gregorian
1	360-day
2	365-day
3	Proleptic Gregorian
4–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 3.2 – Time Domain Template number

Code figure	Meaning
0	Forecast point in time
1	Forecast time interval
2	Forecast two nested time intervals
3	Forecast three nested time intervals
4	Forecast time interval with number of processed data values

Code figure	Meaning
5	Forecast two nested time intervals with number of processed data values
6	Forecast three nested time intervals with number of processed data values
7–32767	Reserved
32768–65534	Reserved for local use
65535	Missing

Code Table 3.3– Indicator of unit of time range

Code figure	Meaning
0	Minute
1	Hour
2	Day
3	Month
4	Year
5	Decade (10 years)
6	Normal (30 years)
7	Century (100 years)
8–9	Reserved
10	3 hours
11	6 hours
12	12 hours
13	Second
14–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 3.4 – Type of time statistical processing

Code figure	Meaning
0	Average
1	Accumulation (see Note 1)
2	Maximum
3	Minimum

Code figure	Meaning
4	Difference (value at the end of time range minus value at the beginning)
5	Root mean square
6	Standard deviation
7	Covariance (temporal variance) (see Note 2)
8	Difference (value at the start of time range minus value at the end)
9	Ratio
10	Standardized anomaly
11	Summation
12–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 3.5 – Observable quantity units after statistical processing

Code figure	Meaning
0	Unchanged
1	Multiply by time
2–32767	Reserved
32768–65534	Reserved for local use
65535	Missing

Code and Flag Tables used in Section 4 (Horizontal Domain Section)

Code Table 4.0 – Horizontal Domain Template number

Code figure	Meaning
0	Latitude/longitude regular grid on an ellipsoidal planet
1	Rotated latitude/longitude regular grid on an ellipsoidal planet

Code figure	Meaning
2	Stretched latitude/longitude regular grid on an ellipsoidal planet
3	Stretched and rotated latitude/longitude regular grid on ellipsoidal planet
4	Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet
5	Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet
6	Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet
7	Latitudes simple packing, regular Longitudes on ellipsoidal planet
8	Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet
9	Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet
10	Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet
11	Regular Latitudes, regular Longitudes on ellipsoidal planet
12	Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
13	Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid
14	Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
15	Latitudes simple packing, regular Longitudes on ellipsoidal planet, sub-grid

Code figure	Meaning
16	Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
17	Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid
18	Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
19	Regular Latitudes, regular Longitudes on ellipsoidal planet
20	Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet
21	Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet
22	Rotated Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet
23	Rotated Latitudes simple packing, regular Longitudes on ellipsoidal planet
24	Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet
25	Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet
26	Rotated Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
27	Rotated Regular Latitudes, regular Longitudes on ellipsoidal planet
28	Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Code figure	Meaning
29	Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid
30	Rotated Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
31	Rotated Latitudes simple packing, regular Longitudes on ellipsoidal planet, sub-grid
32	Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
33	Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid
34	Rotated Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid
35	Rotated Regular Latitudes, regular Longitudes on ellipsoidal planet
36	Latitude/longitude unstructured mesh on ellipsoidal planet simple packing
37	Rotated Latitude/longitude unstructured mesh on ellipsoidal planet simple packing
38	Latitude/longitude irregular grid on ellipsoidal planet simple packing
39	Rotated Latitude/longitude irregular grid on ellipsoidal planet simple packing
40	Spherical harmonic coefficients on ellipsoidal planet
41	Rotated Spherical harmonic coefficients on ellipsoidal planet
42	URL
43–32767	Reserved
32768–65534	Reserved for local use
65535	Missing

Flag Table 4.1 – Resolution and component flags

Bit No.	Value Meaning
1–2	Reserved
3	0 - i direction increments not given
	1 - i direction increments given
4	0 - j direction increments not given
	1 - j direction increments given
5	0 - Resolved u- and v- components of vector quantities relative to easterly and northerly directions
	1 - Resolved u- and v- components of vector quantities relative to the defined grid in the direction of increasing x and y (or i and j) coordinates, respectively
6–8	Reserved – set to zero

Flag Table 4.2 – Scanning mode

Bit No.	Value Meaning
1	0 Points of first row or column scan in the +i (+x) direction
	1 Points of first row or column scan in the –i (–x) direction
2	0 Points of first row or column scan in the –j (–y) direction
	1 Points of first row or column scan in the +j (+y) direction
3	0 Adjacent points in i (x) direction are consecutive
	1 Adjacent points in j (y) direction is consecutive
4	0 All rows scan in the same direction
	1 Adjacent rows scans in the opposite direction
5	0 Points within odd rows are not offset in i (x) direction
	1 Points within odd rows are offset by Di/2 in i (x) direction
6	0 Points within even rows are not offset in i (x) direction

Bit No.	Value Meaning
	1 Points within even rows are offset by Di/2 in i (x) direction
7	0 Points are not offset in j (y) direction
	1 Points are offset by Dj/2 in j (y) direction
8	0 Rows have Ni grid points and columns have Nj grid points
	1 Rows have Ni grid points if points are not offset in i direction
	Rows have Ni–1 grid points if points are offset by Di/2 in i direction
	Columns have Nj grid points if points are not offset in j direction
	Columns have Nj–1 grid points if points are offset by Dj/2 in j direction

Notes:

1. i direction: west to east along a parallel or left to right along an x-axis.
2. j direction: south to north along a meridian, or bottom to top along a y-axis.
3. If bit number 4 is set, the first row scan is as defined by previous flags.
4. La1 and Lo1 define the first row, which is an odd row.
5. Di and Dj are assumed to be positive, with the direction of i and j being given by bits 1 and 2.
6. Bits 5 through 8 may be used to generate staggered grids, such as Arakawa grids (see Part B, GRIB Attachment II).
7. If any of bits 5, 6, 7 or 8 are set, Di and Dj are not optional.

Code Table 4.3 – Latitudes generating algorithm

Code figure	Meaning
0	Gaussian quadrature points
1	Regular latitudes
2	Shifted regular latitudes
3	Chebyskev nodes
4-191	Reserved
192-254	Reserved for local use
255	Missing

Code Table 4.4 – Spectral data representation type

Code figure	Meaning
0	Reserved
1	as defined in Note 1
2-191	Reserved
192-254	Reserved for local use
255	Missing

Note:

1. The associated Legendre functions of the first kind are defined by:

   ```
   \[P_{n}^{m}(\mu) = \sqrt{(2n+1)\frac{(n-m)!}{(n+m)!}}\frac{1}{2^{n}n!}(1-
   \mu^{2})^{m/2}\frac{d^{n+m}}{d\mu^{n+m}}(\mu^{2}-1)^{n},m \geq 0\]
   \[P_{n}^{m}(\mu) = P_{n}^{-m}(\mu)\]
   ```

   A field `F(\lambda,\mu)` is represented by:

   ```
   \[F(\lambda,\mu) = \sum_{m=-
   m}^{M}\sum_{n=\left|m\right|}^{N(m)}F_{n}^{m}P_{n}^{m}(\mu)e^{im\lambda}\]
   ```

   where `\lambda` is the longitude,

   `\mu` the sine of latitude,

   and `F_{n}^{-m}` the complex conjugate of `F_{n}^{m}`

Code Table 4.5 – Spectral data representation mode

Code figure	Meaning
0	Reserved
1	Complex Numbers are stored as pairs of Real (see Note 1)
2–191	Reserved
192-254	Reserved for local use
255	Missing

Note:

1. The complex numbers `F_{n}^{m}` (see Code Figure 1 in Code Table 4.4) are stored for `m ≠ 0` as pairs of real numbers `\Re(F_{n}^{m}),\Im(F_{n}^{m})` ordered with `n` increasing from `m` to `N(m)`, first for `m = 0` and then for `m = 1, 2, ... M`

Values of `N(m)` for common truncation cases:

Triangular: `M = J = K, N(m) = J`

Rhomboidal: `K = J + M, N(m) = J + m`

Trapezoidal: `K = J, K > M, N(m) = J`

Code Table 4.6 – Verification checksum algorithm

Code figure	Meaning
0	CRC32
1	MD5
2	SHA1
3-191	Reserved
192-254	Reserved for local use
255	Missing

Code Tables used in Section 5 (Vertical Domain Section)

Code Table 5.0 – Vertical Coordinate Template number

Code figure	Meaning
0	Vertical level
1	Vertical layer
2	Model level with list of parameters
3	Model layer with list of parameters
4	Model level with list of parameters and URL of auxiliary fields
5	Model level with URL of list of parameters and URL of auxiliary fields
6	Layer of model level with list of parameters and URL of auxiliary fields
7	Layer of model level with URL of list of parameters and URL of auxiliary fields
8–32767	Reserved
32768–65534	Reserved for local use

Code figure	Meaning
65535	Missing

Code Table 5.1 – Fixed surface types and units

Code figure	Meaning	Units
0	Reserved	
1	Ground or water surface	–
2	Cloud base level	–
3	Level of cloud tops	–
4	Level of 0 °C isotherm	–
5	Level of adiabatic condensation lifted from the surface	–
6	Maximum wind level	–
7	Tropopause	–
8	Nominal top of the atmosphere	–
9	Sea bottom	–
10	Reserved	–
11	Cumulonimbus (CB) base	m
12	Cumulonimbus (CB) top	m
13–19	Reserved	
20	Isothermal level	K
21–99	Reserved	
100	Isobaric surface	Pa
101	Mean sea level	-
102	Specific altitude above mean sea level	m
103	Specified height level above ground	m
104	Sigma level	“sigma” value
105	Hybrid level	–
106	Depth below land surface	m
107	Isentropic (theta) level	K
108	Level at specified pressure difference from ground to level	Pa
109	Potential vorticity surface	K m2 kg–1 s–1

Code figure	Meaning	Units
110	Reserved	
111	Eta level	–
112	Reserved	
113	Logarithmic hybrid level	-
114	Snow level	Numeric
115–116	Reserved	
117	Mixed layer depth	m
118	Hybrid height level	–
119	Hybrid pressure level	–
120–159	Reserved	
160	Depth below sea level	m
161	Depth below water surface	m
162	Lake or river bottom	–
163	Bottom of sediment layer	–
164	Bottom of thermally active sediment layer	–
165	Bottom of sediment layer penetrated by thermal wave	–
166	Mixing layer	–
167	Bottom of root zone	–
168–173	Reserved	
174	Top surface of ice on sea, lake or river	–
175	Top surface of ice, under snow cover, on sea, lake or river	–
176	Bottom surface (underside) ice on sea, lake or river	–
177	Deep soil (of indefinite depth)	–
178	Reserved	
179	Top surface of glacier ice and inland ice	–
180	Deep inland or glacier ice (of indefinite depth)	–
181	Grid tile land fraction as a model surface	–

Code figure	Meaning	Units
182	Grid tile water fraction as a model surface	–
183	Grid tile ice fraction on sea, lake or river as a model surface	–
184	Grid tile glacier ice and inland ice fraction as a model surface	–
185–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Notes:

1. The Eta vertical coordinate system involves normalizing the pressure at some point on a specific level by the mean sea level pressure at that point.
2. Hybrid height level (Code figure 118) can be defined as:

   `z(k) = A(k) + B(k) * orog`

   (`k` = 1,...,NLevels; `orog` = orography; `z(k)` = height in metres at level `k`)

3. Hybrid pressure level, for which Code figure 119 shall be used instead of 105, can be defined as:

   `p(k) = A(k) + B(k) * sp`

   (`k` = 1,...,NLevels; `sp` = surface pressure; `p(k)` = pressure at level `k`)

Code Table 5.2 – Algorithm to compute height, depth or pressure level

Code figure	Meaning
0	The atmosphere is divided into NLEV pressure layers.
1-191	Reserved
192-254	Reserved for local use
255	Missing

Note:

1. The layers are defined by the pressures at the interfaces between them (the 'half-levels'), and these pressures are given by

   ```
   \[p_{k+1/2} = A_{k+1/2} + B_{k+1/2} * p_{s} \;\;\quad(1)\]
   ```

for $0 \leq k \leq NLEV$. The $A_{k+1/2}$ and $B_{k+1/2}$ are constants whose values effectively define the vertical coordinate and ps is the surface pressure field.

The values of the $A_{k+1/2}$ and $B_{k+1/2}$ for all $0 \leq k \leq NLEV$ are the list of parameters and p_{s} is the auxiliary field needed to compute the pressure p_{k} associated with each model level (middle of layer) from

$$p_{k} = 1/2 (p_{k□1/2} + p_{k+1/2})$$

with $1 \leq k \leq NLEV$ by using (1) and the surface pressure.

Code Table 5.3 – Verification checksum algorithm

Code figure	Meaning
0	CRC32
1	MD5
2	SHA1
3-191	Reserved
192-254	Reserved for local use
255	Missing

Code Tables used in Section 6 (Generating Process Section)

Code table 6.0 – Generating process template number

Code figure	Meaning
0	Forecast, analysis or observation
1	Individual ensemble forecast or analysis, control and perturbed
2	Statistical post-processing of all ensemble members
3–32767	Reserved
32768–65534	Reserved for local use
65535	Missing

Code table 6.1 – Type of generating process

Code figure	meaning
0	Analysis
1	Initialization
2	Forecast
3	Bias corrected forecast
4	Ensemble forecast
5	Probability forecast
6	Forecast error
7	Analysis error
8	Observation
9	Climatological
10	Probability-weighted forecast
11	Bias-corrected ensemble forecast
12	Post-processed analysis (see Note 1)
13	Post-processed forecast (see Note 1)
14	Nowcast
15	Hindcast
16	Physical retrieval
17	Regression analysis
18–191	Reserved
192–254	Reserved for local use
255	Missing

Note:

1. 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.

Code table 6.2 – Type of ensemble member

Code figure	Meaning
0	Unperturbed high-resolution control forecast
1	Unperturbed low-resolution control forecast
2	Negatively perturbed forecast
3	Positively perturbed forecast

Code figure	Meaning
4–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 6.3 – Type of statistical post-processing of ensemble members

Code figure	Meaning
0	Unweighted mean
1	Weighted mean
2	Spread
3	Large anomaly index (see Note 1)
4	Interquartile range (range between the 25th and 75th quantile)
5	Minimum
6	Maximum
7–191	Reserved
192–254	Reserved for local use
255	Missing

Note:

1. Large anomaly index is defined as

   ```
   \[\frac{N_{0.5} − N_{−0.5}}{N}\]
   ```

   where `N_{0.5}` is the number of members whose anomaly is higher than 0.5 the observed climatological standard deviation,

   `N_{-0.5}` is the number of members whose anomaly is lower than -0.5 the observed climatological standard deviation

   and `N` the total number of members.

Code Tables used in Section 7 (Observable Property Section)

Code table 7.0 – Observable property template number

Code figure	Meaning
0	Observable property by discipline, category and number
1	Observable property with units conversion
2	Atmospheric chemical or physical constituent
3	Aerosol physical property
4	Aerosol optical property
5–32767	Reserved
32768–65534	Reserved for local use
65535	Missing

Code table 7.1 – Discipline

Code figure	Meaning
0	Meteorological products
1	Hydrological products
2	Land surface products
3	Space products
4–9	Reserved
10	Oceanographic products
11–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.2 – Parameter category by discipline

Note:

1. When a new category is to be added to Code table 7.1 and more than one discipline applies, the choice of discipline should be made based on the intended use of the product.

Product discipline 0 – Meteorological products

Category	Description
0	Temperature
1	Moisture
2	Momentum

Category	Description
3	Mass
4	Short-wave radiation
5	Long-wave radiation
6	Cloud
7	Thermodynamic stability indices
8	Kinematic stability indices
9–12	Reserved
13	Aerosols
14	Trace gases (e.g. ozone, CO2)
15	Radar
16	Forecast radar imagery
17	Electrodynamics
18	Reserved
19	Physical atmospheric properties
20	Atmospheric chemical constituents
21–191	Reserved
192–254	Reserved for local use
255	Missing

Product discipline 1 – Hydrological products

Category	Description
0	Hydrology basic products
1	Reserved
2	Inland water and sediment properties
3–191	Reserved
192–254	Reserved for local use
255	Missing

Product discipline 2 – Land surface products

Category	Description
0	Vegetation/biomass
1	Agri-/aquacultural special products
2	Transportation-related products

Category	Description
3	Soil products
4	Fire weather products
5–191	Reserved
192–254	Reserved for local use
255	Missing

Product discipline 3 – Space products

Category	Description
0	Reserved
1	Reserved
2	Cloud properties
3	Flight rule conditions
4	Volcanic ash
5	Sea-surface temperature
6–191	Reserved
192–254	Reserved for local use
255	Missing

Product discipline 10 – Oceanographic products

Category	Description
0	Waves
1	Currents
2	Ice
3	Surface properties
4	Subsurface properties
5–190	Reserved
191	Miscellaneous
192–254	Reserved for local use
255	Missing

Code table 7.3 – Parameter number by product discipline and parameter category

Notes:

1. By convention, the flux sign is positive if downwards.
2. When a new parameter is to be added to Code table 7.3 and more than one category applies, the choice of category should be made based on the intended use of the product. The discipline and category are an important part of any product definition, so it is possible to have the same parameter name in more than one category. For example, “water temperature” in discipline 10 (oceanographic products), category 4 (subsurface properties) is used for reporting water temperature in the ocean or open sea, and is not the same as “water temperature” in discipline 1 (hydrological products), category 2 (inland water and sediment properties), which is used for reporting water temperature in freshwater lakes and rivers.

Product discipline 0 – Meteorological products, parameter category 0: temperature

Number	Parameter	Units
0	Temperature	K
1	Virtual temperature	K
2	Potential temperature	K
3	Pseudo-adiabatic potential temperature or equivalent potential temperature	K
6	Dewpoint temperature	K
7	Dewpoint depression (or deficit)	K
8	Lapse rate	K m–1
9	Temperature anomaly	K
10	Latent heat net flux	W m–2
11	Sensible heat net flux	W m–2
12	Heat index	K
13	Wind chill factor	K
15	Virtual potential temperature	K
16	Snow phase change heat flux	W m–2
17	Skin temperature	K
18	Snow temperature (top of snow)	K
19	Turbulent transfer coefficient for heat	Numeric
20	Turbulent diffusion coefficient for heat	m2 s–1
21	Apparent temperature (see Note 1)	K

Number	Parameter	Units
22	Temperature tendency due to short-wave radiation	K s–1
23	Temperature tendency due to long-wave radiation	K s–1
24	Temperature tendency due to short-wave radiation,clear sky	K s–1
25	Temperature tendency due to long-wave radiation,clear sky	K s–1
26	Temperature tendency due to parameterization	K s–1
27	Wet-bulb temperature	K
28–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

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

Product discipline 0 – Meteorological products, parameter category 1: moisture

Number	Parameter	Units
0	Specific humidity	kg kg–1
1	Relative humidity	%
2	Humidity mixing ratio	kg kg–1
3	Precipitable water	kg m–2
4	Vapour pressure	Pa
5	Saturation deficit	Pa
6	Evaporation	kg m–2
7	Precipitation rate	kg m–2 s–1
8	Total precipitation	kg m–2
9	Large-scale precipitation (non-convective)	kg m–2
10	Convective precipitation	kg m–2
11	Snow depth	m
12	Snowfall rate water equivalent*	kg m–2 s–1

Number	Parameter	Units
13	Water equivalent of accumulated snow depth	kg m–2
14	Convective snow	kg m–2
15	Large-scale snow	kg m–2
16	Snow melt	kg m–2
17	Snow age	d
18	Absolute humidity	kg m–3
19	Precipitation type	(Code table 7.201)
20	Integrated liquid water	kg m–2
21	Condensate	kg kg–1
22	Cloud mixing ratio	kg kg–1
23	Ice water mixing ratio	kg kg–1
24	Rain mixing ratio	kg kg–1
25	Snow mixing ratio	kg kg–1
26	Horizontal moisture convergence	kg kg–1 s–1
29	Total snowfall	m
30	Precipitable water category	(Code table 7.202)
31	Hail	m
32	Graupel (snow pellets)	kg kg–1
33	Categorical rain	(Code table 7.222)
34	Categorical freezing rain	(Code table 7.222)
35	Categorical ice pellets	(Code table 7.222)
36	Categorical snow	(Code table 7.222)
37	Convective precipitation rate	kg m–2 s–1
38	Horizontal moisture divergence	kg kg–1 s–1
39	Per cent frozen precipitation	%
40	Potential evaporation	kg m–2
41	Potential evaporation rate	W m–2
42	Snow cover	%
43	Rain fraction of total cloud water	Proportion
44	Rime factor	Numeric
45	Total column integrated rain	kg m–2

Number	Parameter	Units
46	Total column integrated snow	kg m–2
47	Large scale water precipitation (non-convective)	kg m–2
48	Convective water precipitation	kg m–2
49	Total water precipitation	kg m–2
50	Total snow precipitation	kg m–2
51	Total column water (Vertically integrated total water (vapour + cloud water/ice))	kg m–2
52	Total precipitation rate (see Note 1)	kg m–2 s–1
53	Total snowfall rate water equivalent (see Note 1)	kg m–2 s–1
54	Large scale precipitation rate	kg m–2 s–1
55	Convective snowfall rate water equivalent	kg m–2 s–1
56	Large scale snowfall rate water equivalent	kg m–2 s–1
57	Total snowfall rate	m s–1
58	Convective snowfall rate	m s–1
59	Large scale snowfall rate	m s–1
60	Snow depth water equivalent	kg m–2
61	Snow density	kg m–3
62	Snow evaporation	kg m–2
63	Reserved	
64	Total column integrated water vapour	kg m–2
65	Rain precipitation rate	kg m–2 s–1
66	Snow precipitation rate	kg m–2 s–1
67	Freezing rain precipitation rate	kg m–2 s–1
68	Ice pellets precipitation rate	kg m–2 s–1
69	Total column integrated cloud water	kg m–2
70	Total column integrated cloud ice	kg m–2
71	Hail mixing ratio	kg kg–1

Number	Parameter	Units
72	Total column integrated hail	kg m–2
73	Hail precipitation rate	kg m–2 s–1
74	Total column integrated graupel	kg m–2
75	Graupel (snow pellets) precipitation rate	kg m–2 s–1
76	Convective rain rate	kg m–2 s–1
77	Large scale rain rate	kg m–2 s–1
78	Total column integrated water (all components including precipitation)	kg m–2
79	Evaporation rate	kg m–2 s–1
80	Total condensate	kg kg–1
81	Total column-integrated condensate	kg m–2
82	Cloud ice mixing-ratio	kg kg–1
83	Specific cloud liquid water content	kg kg–1
84	Specific cloud ice water content	kg kg–1
85	Specific rainwater content	kg kg–1
86	Specific snow water content	kg kg–1
87–89	Reserved	
90	Total kinematic moisture flux	kg kg–1 m s–1
91	u-component (zonal) kinematic moisture flux	kg kg–1 m s–1
92	v-component (meridional) kinematic moisture flux	kg kg–1 m s–1
93	Relative humidity with respect to water	%
94	Relative humidity with respect to ice	%
95	Freezing or frozen precipitation rate	kg m–2 s–1
96	Mass density of rain	kg m–3
97	Mass density of snow	kg m–3
98	Mass density of graupel	kg m–3
99	Mass density of hail	kg m–3

Number	Parameter	Units
100	Specific number concentration of rain	kg–1
101	Specific number concentration of snow	kg–1
102	Specific number concentration of graupel	kg–1
103	Specific number concentration of hail	kg–1
104	Number density of rain	m–3
105	Number density of snow	m–3
106	Number density of graupel	m–3
107	Number density of hail	m–3
108	Specific humidity tendency due to parameterization	kg kg–1 s–1
109–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. Total precipitation/snowfall rate stands for the sum of convective and large-scale precipitation/snowfall rate.

Product discipline 0 – Meteorological products, parameter category 2: momentum

Number	Parameter	Units
0	Wind direction (from which blowing)	degree true
1	Wind speed	m s–1
2	u-component of wind	m s–1
3	v-component of wind	m s–1
4	Stream function	m2 s–1
5	Velocity potential	m2 s–1
6	Montgomery stream function	m2 s–2
7	Sigma coordinate vertical velocity	s–1
8	Vertical velocity (pressure)	Pa s–1

Number	Parameter	Units
9	Vertical velocity (geometric)	m s–1
10	Absolute vorticity	s–1
11	Absolute divergence	s–1
12	Relative vorticity	s–1
13	Relative divergence	s–1
14	Potential vorticity	K m2 kg–1 s–1
15	Vertical u-component shear	s–1
16	Vertical v-component shear	s–1
17	Momentum flux, u-component	N m–2
18	Momentum flux, v-component	N m–2
19	Wind mixing energy	J
20	Boundary layer dissipation	W m–2
22	Wind speed (gust)	m s–1
23	u-component of wind (gust)	m s–1
24	v-component of wind (gust)	m s–1
25	Vertical speed shear	s–1
26	Horizontal momentum flux	N m–2
27	u-component storm motion	m s–1
28	v-component storm motion	m s–1
29	Drag coefficient	Numeric
30	Frictional velocity	m s–1
31	Turbulent diffusion coefficient for momentum	m2 s–1
32	Eta coordinate vertical velocity	s–1
33	Wind fetch	m
34	Normal wind component (see Note 1)	m s–1
35	Tangential wind component (see Note 1)	m s–1
36	Amplitude function for Rossby wave envelope for meridional wind (see Note 2)	m s–1
37	Northward turbulent surface stress	N m–2 s

Number	Parameter	Units
38	Eastward turbulent surface stress	N m–2 s
39	Eastward wind tendency due to parameterization	m s–2
40	Northward wind tendency due to parameterization	m s–2
41	u-component of geostrophic wind	m s–1
42	v-component of geostrophic wind	m s–1
43	Geostrophic wind direction	degree true
44	Geostrophic wind speed	m s–1
45–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Notes:

1. In relation to local coordinate axes at a cell edge.
2. 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.

Product discipline 0 – Meteorological products, parameter category 3: mass

Number	Parameter	Units
0	Pressure	Pa
1	Pressure reduced to MSL	Pa
2	Pressure tendency	Pa s–1
3	ICAO Standard Atmosphere Reference Height	m
4	Geopotential	m2 s–2
5	Geopotential height	gpm
6	Geometric height	m
7	Standard deviation of height	m

Number	Parameter	Units
8	Pressure anomaly	Pa
9	Geopotential height anomaly	gpm
10	Density	kg m–3
11	Altimeter setting	Pa
12	Thickness	m
13	Pressure altitude	m
14	Density altitude	m
15	5-wave geopotential height	gpm
16	Zonal flux of gravity wave stress	N m–2
17	Meridional flux of gravity wave stress	N m–2
18	Planetary boundary layer height	m
19	5-wave geopotential height anomaly	gpm
20	Standard deviation of sub-grid scale orography	m
21	Angle of sub-gridscale orography	rad
22	Slope of sub-gridscale orography	Numeric
23	Gravity wave dissipation	W m–2
24	Anisotropy of sub-gridscale orography	Numeric
25	Natural logarithm of pressure in Pa	Numeric
26	Exner pressure	Numeric
27	Updraught mass flux	kg m–2 s–1
28	Downdraught mass flux	kg m–2 s–1
29	Updraught detrainment rate	kg m–3 s–1
30	Downdraught detrainment rate	kg m–3 s–1
31–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 4: short-wave radiation

Number	Parameter	Units
2	Short-wave radiation flux	W m–2
3	Global radiation flux	W m–2
4	Brightness temperature	K
5	Radiance (with respect to wave number)	W m–1 sr–1
6	Radiance (with respect to wavelength)	W m–3 sr–1
7	Downward short-wave radiation flux	W m–2
8	Upward short-wave radiation flux	W m–2
9	Net short wave radiation flux	W m–2
10	Photosynthetically active radiation	W m–2
11	Net short-wave radiation flux, clear sky	W m–2
12	Downward UV radiation	W m–2
13	Direct short-wave radiation flux	W m–2
14	Diffuse short-wave radiation flux	W m–2
15–49	Reserved	
50	UV index (under clear sky)(see Note 1)	Numeric
51	UV index (see Note 1)	Numeric
52–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. The Global Solar UVI is formulated using the International Commission on Illumination (CIE) reference action spectrum for UV-induced erythema on the human skin (ISO 17166:1999/CIE S 007/E-1998).

   It is a measure of the UV radiation that is relevant to and defined for a horizontal surface. The UVI is a unitless quantity defined by the formula:

```
\[I_{UV} = K_{er}\int_{250nm}^{400nm}E_{\lambda}S_{er}d\lambda\]
```

where `E_{\lambda}` is the solar spectral irradiance expressed in W / (m2·nanometre) at wavelength `\lambda` and `d\lambda` is the wavelength interval used in the summation. `S_{er}(\lambda)` is the erythema reference action spectrum, and `K_{er}` is a constant equal to 40 m2 / W.

Product discipline 0 – Meteorological products, parameter category 5: long-wave radiation

Number	Parameter	Units
2	Long-wave radiation flux	W m–2
3	Downward long-wave radiation flux	W m–2
4	Upward long-wave radiation flux	W m–2
5	Net long-wave radiation flux	W m–2
6	Net long-wave radiation flux, clear sky	W m–2
7	Brightness temperature	K
8–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 6: cloud

Number	Parameter	Units
0	Cloud ice	kg m–2
1	Total cloud cover	%
2	Convective cloud cover	%
3	Low cloud cover	%
4	Medium cloud cover	%
5	High cloud cover	%
6	Cloud water	kg m–2
7	Cloud amount	%
8	Cloud type	(Code table 7.203)
9	Thunderstorm maximum tops	m
10	Thunderstorm coverage	(Code table 7.204)

Number	Parameter	Units
11	Cloud base	m
12	Cloud top	m
13	Ceiling	m
14	Non-convective cloud cover	%
15	Cloud work function	J kg–1
16	Convective cloud efficiency	Proportion
17	Total condensate	kg kg–1
21	Ice fraction of total condensate	Proportion
22	Cloud cover	%
23	Cloud ice mixing ratio	kg kg–1
24	Sunshine	Numeric
25	Horizontal extent of cumulonimbus (CB)	%
26	Height of convective cloud base	m
27	Height of convective cloud top	m
28	Number of cloud droplets per unit mass of air	kg–1
29	Number of cloud ice particles per unit mass of air	kg–1
30	Number density of cloud droplets	m–3
31	Number density of cloud ice particles	m–3
32	Fraction of cloud cover	Numeric
33	Sunshine duration	s
34	Surface long-wave effective total cloudiness	Numeric
35	Surface short-wave effective total cloudiness	Numeric
36	Fraction of stratiform precipitation cover	Proportion
37	Fraction of convective precipitation cover	Proportion
38	Mass density of cloud droplets	kg m–3
39	Mass density of cloud ice	kg m–3

Number	Parameter	Units
40	Mass density of convective cloud water droplets	kg m–3
41–46	Reserved	
47	Volume fraction of cloud water droplets (see Note 1)	Numeric
48	Volume fraction of cloud ice particles (see Note 1)	Numeric
49	Volume fraction of cloud (ice and/or water) (see Note 1)	Numeric
50–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. The sum of the water and ice fractions may exceed the total due to overlap between the volumes containing ice and those containing liquid water.

Product discipline 0 – Meteorological products, parameter category 7: thermodynamic stability indices

Number	Parameter	Units
0	Parcel lifted index (to 500 hPa)	K
1	Best lifted index (to 500 hPa)	K
2	K index	K
3	KO index	K
4	Total totals index	K
5	Sweat index	Numeric
6	Convective available potential energy	J kg–1
7	Convective inhibition	J kg–1
8	Storm relative helicity	J kg–1
9	Energy helicity index	Numeric
10	Surface lifted index	K
11	Best (4-layer) lifted index	K
12	Richardson number	Numeric
13	Showalter index	K
14	Reserved	

Number	Parameter	Units
15	Updraught helicity	m2 s–2
16	Bulk Richardson number	Numeric
17	Gradient Richardson number	Numeric
18	Flux Richardson number	Numeric
19–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 13: aerosols

Number	Parameter	Units
0	Aerosol type	(Code table 7.205)
1–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 14: trace gases

Number	Parameter	Units
0	Total ozone	DU
1	Ozone mixing ratio	kg kg–1
2	Total column integrated ozone	DU
3–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 15: radar

Number	Parameter	Units
0	Base spectrum width	m s–1
1	Base reflectivity	dB
2	Base radial velocity	m s–1
3	Vertically integrated liquid water (VIL)	kg m–2

Number	Parameter	Units
4	Layer-maximum base reflectivity	dB
5	Precipitation	kg m–2
6	Radar spectra (1)	–
7	Radar spectra (2)	–
8	Radar spectra (3)	–
9	Reflectivity of cloud droplets	dB
10	Reflectivity of cloud ice	dB
11	Reflectivity of snow	dB
12	Reflectivity of rain	dB
13	Reflectivity of graupel	dB
14	Reflectivity of hail	dB
15	Hybrid scan reflectivity	dB
16	Hybrid scan reflectivity height	m
17–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product Discipline 0 – Meteorological products, parameter category 16: forecast radar imagery

Number	Parameter	Units
0	Equivalent radar reflectivity factor for rain	mm6 m–3
1	Equivalent radar reflectivity factor for snow	mm6 m–3
2	Equivalent radar reflectivity factor for parameterized convection	mm6 m–3
3	Echo top	m
4	Reflectivity	dB
5	Composite reflectivity	dB
6–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. Decibel (dB) is a logarithmic measure of the relative power, or of the relative values of two flux densities, especially of sound intensities and radio and radar power densities. In radar meteorology, the logarithmic scale (dBZ) is used for measuring radar reflectivity factor (obtained from the American Meteorological Society Glossary of Meteorology).

Product discipline 0 – Meteorological products, parameter category 17: electrodynamics

Number	Parameter	Units
0	Lightning strike density	m–2 s–1
1-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 18: nuclear/radiology

Number	Parameter	Units
0	Air concentration of caesium 137	Bq m–3
1	Air concentration of iodine 131	Bq m–3
2	Air concentration of radioactive pollutant	Bq m–3
3	Ground deposition of caesium 137	Bq m–2
4	Ground deposition of iodine 131	Bq m–2
5	Ground deposition of radioactive pollutant	Bq m–2
6	Time-integrated air concentration of caesium pollutant (see Note 1)	Bq s m–3
7	Time-integrated air concentration of iodine pollutant (see Note 1)	Bq s m–3
8	Time-integrated air concentration of radioactive pollutant (see Note 1)	Bq s m–3
9	Reserved	
10	Air concentration	Bq m–3
11	Wet deposition	Bq m–2

Number	Parameter	Units
12	Dry deposition	Bq m–2
13	Total deposition (wet + dry)	Bq m–2
14–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Notes:

1. Statistical process 1 (Accumulation) does not change units. It is recommended to use another parameter without the word “time-integrated” in its name and accumulation in PDT.
2. Parameters from 10 onward may be used in combination with templates containing the Template Component 7.2 and Common Code table C–14 to represent any type of radioisotope.

Product discipline 0 – Meteorological products, parameter category 19: physical atmospheric

Number	Parameter	Units
0	Visibility	m
1	Albedo	%
2	Thunderstorm probability	%
3	Mixed layer depth	m
4	Volcanic ash	(Code table 7.206)
5	Icing top	m
6	Icing base	m
7	Icing	(Code table 7.207)
8	Turbulence top	m
9	Turbulence base	m
10	Turbulence	(Code table 7.208)
11	Turbulent kinetic energy	J kg–1
12	Planetary boundary-layer regime	(Code table 7.209)
13	Contrail intensity	(Code table 7.210)
14	Contrail engine type	(Code table 7.211)
15	Contrail top	m
16	Contrail base	m
17	Maximum snow albedo (see Note 1)	%

Number	Parameter	Units
18	Snow free albedo	%
19	Snow albedo	%
20	Icing	%
21	In-cloud turbulence	%
22	Clear air turbulence (CAT)	%
23	Supercooled large droplet probability (see Note 2)	%
24	Convective turbulent kinetic energy	J kg–1
25	Weather	(Code table 7.225)
26	Convective outlook	(Code table 7.224)
27	Icing scenario	(Code table 7.227)
28	Mountain wave turbulence (eddy dissipation rate)	m2/3 s–1
29–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Notes:

1. Parameter deprecated. See Regulation 92.6.2 and use another parameter instead.
2. Supercooled large droplets (SLD) are defined as those with a diameter greater than 50 microns.

Product discipline 0 – Meteorological products, parameter category 20: atmospheric chemical constituents

number	parameter	Units
0	Mass density (concentration)	kg m–3
1	Column-integrated mass density (see Note)	kg m–2
2	Mass mixing ratio (mass fraction in air)	kg kg–1
3	Atmosphere emission mass flux	kg m–2 s–1
4	Atmosphere net production mass flux	kg m–2 s–1
5	Atmosphere net production and emission mass flux	kg m–2 s–1

number	parameter	Units
6	Surface dry deposition mass flux	kg m–2 s–1
7	Surface wet deposition mass flux	kg m–2 s–1
8	Atmosphere re-emission mass flux	kg m–2 s–1
9	Wet deposition by large-scale precipitation mass flux	kg m–2 s–1
10	Wet deposition by convective precipitation mass flux	kg m–2 s–1
11	Sedimentation mass flux	kg m–2 s–1
12	Dry deposition mass flux	kg m–2 s–1
13	Transfer from hydrophobic to hydrophilic	kg kg–1 s–1
14	Transfer from SO2 (sulphur dioxide) to SO4 (sulphate)	kg kg–1 s–1
15–49	Reserved	
50	Amount in atmosphere	mol
51	Concentration in air	mol m–3
52	Volume mixing ratio (fraction in air)	mol mol–1
53	Chemical gross production rate of concentration	mol m–3 s–1
54	Chemical gross destruction rate of concentration	mol m–3 s–1
55	Surface flux	mol m–2 s–1
56	Changes of amount in atmosphere (see Note)	mol s–1
57	Total yearly average burden of the atmosphere	mol
58	Total yearly averaged atmospheric loss (see Note)	mol s–1
59	Aerosol number concentration	m–3
60–99	Reserved	
100	Surface area density (aerosol)	m–1
101	Vertical visual range	m
102	Aerosol optical thickness	Numeric

number	parameter	Units
103	Single scattering albedo	Numeric
104	Asymmetry factor	Numeric
105	Aerosol extinction coefficient	m–1
106	Aerosol absorption coefficient	m–1
107	Aerosol lidar backscatter from satellite	m–1 sr–1
108	Aerosol lidar backscatter from the ground	m–1 sr–1
109	Aerosol lidar extinction from satellite	m–1
110	Aerosol lidar extinction from the ground	m–1
111–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. FirstFixedSurface and SecondFixedSurface of Code table 5.1 (Fixed surface types and units) to define the vertical extent, i.e. FirstFixedSurface can be set to 1 (Ground or water surface) and SecondFixedSurface set to 7 (Tropopause) for a restriction to the troposphere.

Product discipline 0 – Meteorological products, parameter category 190: CCITT IA5 string

Number	Parameter	Units
0	Arbitrary text string	CCITT IA5
1–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 0 – Meteorological products, parameter category 191: miscellaneous

Number	Parameter	Units
0	Seconds prior to initial reference time (defined in Section 1)	s
1	Geographical latitude	°N
2	Geographical longitude	°E

Number	Parameter	Units
3	Days since last observation	d
4–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 1 – Hydrological products, parameter category 0: hydrology basic products

Number	Parameter	Units
0	Flash flood guidance (encoded as an accumulation over a floating subinterval of time between the reference time and valid time)	kg m-2
1	Flash flood runoff (encoded as an accumulation over a floating subinterval of time)	kg m-2
2	Remotely sensed snow cover	(Code table 7.215)
3	Elevation of snow-covered terrain	(Code table 7.216)
4	Snow water equivalent per cent of normal	%
5	Baseflow-groundwater runoff	kg m–2
6	Storm surface runoff	kg m–2
7	Discharge from rivers or streams	m3 s–1
8	Groundwater upper storage	kg m–2
9	Groundwater lower storage	kg m–2
10	Side flow into river channel	m3 s–1 m–1
11	River storage of water	m3
12	Floodplain storage of water	m3
13	Depth of water on soil surface	kg m–2
14	Upstream accumulated precipitation	kg m–2
15	Upstream accumulated snow melt	kg m–2
16–191	Reserved	

Number	Parameter	Units
192–254	Reserved for local use	
255	Missing	

Notes:

1. Remotely sensed snow cover is expressed as a field of dimensionless, thematic values. The currently accepted values are for no-snow/no-cloud, 50, for clouds, 100, and for snow, 250 (see Code table 7.215).
2. A data field representing snow coverage by elevation portrays at which elevations there is a snow pack. The elevation values typically range from 0 to 90 in 100-metre increments. A value of 253 is used to represent a no-snow/no-cloud data point. A value of 254 is used to represent a data point at which snow elevation could not be estimated because of clouds obscuring the remote sensor (when using aircraft or satellite measurements).
3. Snow water equivalent per cent of normal is stored in per cent of normal units. For example, a value of 110 indicates 110 per cent of the normal snow water equivalent for a given depth of snow.

Product discipline 1 – Hydrological products, parameter category 2: inland water and sediment properties

Number	Parameter	Units
0	Water depth	m
1	Water temperature	K
2	Water fraction	Proportion
3	Sediment thickness	m
4	Sediment temperature	K
5	Ice thickness	m
6	Ice temperature	K
7	Ice cover	Proportion
8	Land cover (0 = water, 1 = land)	Proportion
9	Shape factor with respect to salinity profile	
10	Shape factor with respect to temperature profile in thermocline	
11	Attenuation coefficient of water with respect to solar radiation	m–1
12	Salinity	kg kg–1
13	Cross-sectional area of flow in channel	m2

Number	Parameter	Units
14-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 2 – Land surface products, parameter category 0: vegetation/biomass

Number	Parameter	Units
0	Land cover (0 = sea, 1 = land)	Proportion
1	Surface roughness	m
2	Soil temperature	K
3	Soil moisture content	kg m–2
4	Vegetation	%
5	Water runoff	kg m–2
6	Evapotranspiration	kg–2 s–1
7	Model terrain height	m
8	Land use	(Code table 7.212)
9	Volumetric soil moisture content	Proportion
10	Ground heat flux	W m–2
11	Moisture availability	%
12	Exchange coefficient	kg m–2 s–1
13	Plant canopy surface water	kg m–2
14	Blackadar’s mixing length scale	m
15	Canopy conductance	m s–1
16	Minimal stomatal resistance	s m–1
17	Wilting point	Proportion
18	Solar parameter in canopy conductance	Proportion
19	Temperature parameter in canopy	Proportion
20	Humidity parameter in canopy conductance	Proportion
21	Soil moisture parameter in canopy conductance	Proportion
22	Soil moisture	kg m–3

Number	Parameter	Units
23	Column-integrated soil water	kg m–2
24	Heat flux	W m–2
25	Volumetric soil moisture	m3 m–3
26	Wilting point	kg m–3
27	Volumetric wilting point	m3 m–3
28	Leaf area index	Numeric
29	Evergreen forest cover	Proportion
30	Deciduous forest cover	Proportion
31	Normalized differential vegetation index (NDVI)	Numeric
32	Root depth of vegetation	m
33	Water runoff and drainage	kg m–2
34	Surface water runoff	kg m–2
35	Tile class	(Code table 7.243)
36	Tile fraction	Proportion
37	Tile percentage	%
38	Soil volumetric ice content (water equivalent)(see Note)	m3 m–3
39–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. For parameter 38 (Parameter category 0), ice volume is expressed as if the ice content were melted to liquid water and then its volume measured in the liquid state. This may be understood in the same manner as water equivalent snow depth.

Product discipline 2 – Land surface products, parameter category 3: soil products

Number	Parameter	Units
0	Soil type	(Code table 7.213)
5	Liquid volumetric soil moisture (non-frozen) (see Note 1)	Proportion
6	Number of soil layers in root zone	Numeric

Number	Parameter	Units
7	Transpiration stress-onset (soil moisture) (see Note 1)	Proportion
8	Direct evaporation cease (soil moisture) (see Note 1)	Proportion
9	Soil porosity (see Note 1)	Proportion
10	Liquid volumetric soil moisture (non-frozen)	m3 m–3
11	Volumetric transpiration stress-onset (soil moisture)	m3 m–3
12	Transpiration stress-onset (soil moisture)	kg m–3
13	Volumetric direct evaporation cease (soil moisture)	m3 m–3
14	Direct evaporation cease (soil moisture)	kg m–3
15	Soil porosity	m3 m–3
16	Volumetric saturation of soil moisture	m3 m–3
17	Saturation of soil moisture	kg m–3
18	Soil temperature	K
19	Soil moisture	kg m–3
20	Column-integrated soil moisture	kg m–2
21	Soil ice	kg m–3
22	Column-integrated soil ice	kg m–2
23	Liquid water in snow pack	kg m–2
24	Frost index	K day–1
25	Snow depth at elevation bands	kg m–2
26–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. It is recommended not to use this parameter, but another one with a more descriptive unit.

Product discipline 2 – Land surface products, parameter category 4: fire weather products

Number	Parameter	Units
0	Fire outlook	(Code table 7.224)
1	Fire outlook due to dry thunderstorm	(Code table 7.224)
2	Haines index	Numeric
3	Fire burned area	%
4	Fosberg index (see Note 1)	Numeric
5	Forest Fire Weather Index	Numeric
6	Fine Fuel Moisture Code	Numeric
7	Duff Moisture Code	Numeric
8	Drought	Numeric
9	Initial Fire Spread Index	Numeric
10	Fire Buildup Index	Numeric
11	Fire Daily Severity Rating	Numeric
12–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. 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.

Product discipline 2 – Land surface products, parameter category 5: glaciers and inland ice

Number	Parameter	Units
1	Glacier temperature	K
2-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 3 – Space products, parameter category 0: image format products

Number	Parameter	Units
1	Glacier temperature	K
2-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 3 – Space products, parameter category 1: quantitative products

Number	Parameter	Units
0	Estimated precipitation	kg m–2
1	Instantaneous rain rate	kg m–2 s–1
2	Cloud top height	m
3	Cloud top height quality indicator	(Code table 7.219)
4	Estimated u-component of wind	m s–1
5	Estimated v-component of wind	m s–1
6	Number of pixel used	Numeric
7	Solar zenith angle	°
8	Relative azimuth angle	°
9	Reflectance in 0.6 micron channel	%
10	Reflectance in 0.8 micron channel	%
11	Reflectance in 1.6 micron channel	%
12	Reflectance in 3.9 micron channel	%
13	Atmospheric divergence	s–1
14	Cloudy brightness temperature	K
15	Clear-sky brightness temperature	K
16	Cloudy radiance (with respect to wave number)	W m–1 sr–1
17	Clear-sky radiance (with respect to wave number)	W m–1 sr–1
18	Reserved	
19	Wind speed	m s–1

Number	Parameter	Units
20	Aerosol optical thickness at 0.635 μm	
21	Aerosol optical thickness at 0.810 μm	
22	Aerosol optical thickness at 1.640 μm	
23	Angstrom coefficient	
24–26	Reserved	
27	Bidirectional reflectance factor (see Note 1)	numeric
28	Brightness temperature	K
29	Scaled radiance (see Note 2)	numeric
30–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Notes:

1. The ratio of the radiant flux reflected by a surface to that reflected into the same reflected-beam geometry and wavelength range by an ideal (lossless) and diffuse (Lambertian) standard surface, irradiated under the same conditions.
2. Top of atmosphere radiance observed by a sensor, multiplied by pi and divided by the in-band solar irradiance.

Product discipline 3 – Space products, parameter category 2: cloud properties

Number	Parameter	Units
0	Clear sky probability	%
1	Cloud top temperature	K
2	Cloud top pressure	Pa
3	Cloud type	(Code table 7.218)
4	Cloud phase	(Code table 7.218)
5	Cloud optical depth	Numeric
6	Cloud particle effective radius	m
7	Cloud liquid water path	kg m–2
8	Cloud ice water path	kg m–2
9	Cloud albedo	Numeric

Number	Parameter	Units
10	Cloud emissivity	Numeric
11	Effective absorption optical depth ratio	Numeric
12-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 3 – Space products, parameter category 3: flight rule conditions

Number	Parameter	Units
0	Probability of encountering marginal visual flight rule conditions	%
1	Probability of encountering low instrument flight rule conditions	%
2	Probability of encountering instrument flight rule conditions	%
3-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 3 – Space products, parameter category 4: volcanic ash

Number	Parameter	Units
0	Volcanic ash probability	%
1	Volcanic ash cloud top temperature	K
2	Volcanic ash cloud top pressure	Pa
3	Volcanic ash cloud top height	m
4	Volcanic ash cloud emissivity	Numeric
5	Volcanic ash effective absorption optical depth ratio	Numeric
6	Volcanic ash cloud optical depth	Numeric
7	Volcanic ash column density	kg m–2

Number	Parameter	Units
8	Volcanic ash particle effective radius	m
9-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Product discipline 3 – Space products, parameter category 5: sea-surface temperature

Number	Parameter	Units
0	Interface sea-surface temperature (see Note 1)	K
1	Skin sea-surface temperature (see Note 2)	K
2	Sub-skin sea-surface temperature (see Note 3)	K
3	Foundation sea-surface temperature (see Note 4)	K
4	Estimated bias between sea-surface temperature and standard	K
5	Estimated standard deviation between sea-surface temperature and standard	K
6-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Notes:

1. Theoretical temperature at the precise air-sea interface.
2. Temperature of the water across a very small depth (approximately the upper 20 micrometers).
3. Temperature at the base of the thermal skin layer.
4. Temperature of the water column free of diurnal temperature variability or equal to the SST sub-skin in the absence of any diurnal signal.

Product discipline 3 – Space products, parameter category 6: solar radiation

Number	Parameter	Units
0	Global solar irradiance (see Note 1)	W m–2
1	Global solar exposure (see Note 2)	J m–2
2	Direct solar irradiance (see Note 3)	W m–2
3	Direct solar exposure (see Note 4)	J m–2
4	Diffuse solar irradiance (see Note 5)	W m–2
5	Diffuse solar exposure (see Note 6)	J m–2
6-191	Reserved	
192-254	Reserved for local use	
255	Missing	

Notes:

1. The solar flux per unit area received from a solid angle of 2π sr on a horizontal surface.
2. Time integral of global solar irradiance.
3. The solar flux per unit area received from the solid angle of the sun's disc on a surface normal to the sun direction.
4. Time integral of direct solar irradiance.
5. The solar flux per unit area received from a solid angle of 2π sr, except for the solid angle of the sun's disc, on a horizontal surface.
6. Time integral of diffuse solar irradiance.

Product discipline 10 – Oceanographic products, parameter category 0: waves

Number	Parameter	Units
0	Wave spectra (1)	–
1	Wave spectra (2)	–
2	Wave spectra (3)	–
3	Significant height of combined wind waves and swell	m
4	Direction of wind waves	degree true
5	Significant height of wind waves	m

Number	Parameter	Units
6	Mean period of wind waves	s
7	Direction of swell waves	degree true
8	Significant height of swell waves	m
9	Mean period of swell waves	s
10	Primary wave direction	degree true
11	Primary wave mean period	s
12	Secondary wave direction	degree true
13	Secondary wave mean period	s
14	Direction of combined wind waves and swell	degree true
15	Mean period of combined wind waves and swell	s
16	Coefficient of drag with waves	–
17	Friction velocity	m s–1
18	Wave stress	N m–2
19	Normalized wave stress	–
20	Mean square slope of waves	–
21	u-component surface Stokes drift	m s–1
22	v-component surface Stokes drift	m s–1
23	Period of maximum individual wave height	s
24	Maximum individual wave height	m
25	Inverse mean wave frequency	s
26	Inverse mean frequency of wind waves	s
27	Inverse mean frequency of total swell	s
28	Mean zero-crossing wave period	s
29	Mean zero-crossing period of wind waves	s
30	Mean zero-crossing period of total swell	s

Number	Parameter	Units
31	Wave directional width	–
32	Directional width of wind waves	–
33	Directional width of total swell	–
34	Peak wave period	s
35	Peak period of wind waves	s
36	Peak period of total swell	s
37	Altimeter wave height	m
38	Altimeter corrected wave height	m
39	Altimeter range relative correction	–
40	10-metre neutral wind speed over waves	m s–1
41	10-metre wind direction over waves	°
42	Wave energy spectrum	m2 s rad–1
43	Kurtosis of the sea-surface elevation due to waves	-
44	Benjamin–Feir index	–
45	Spectral peakedness factor	s–1
46–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. Further information concerning the wave parameters can be found in the Guide to Wave Analysis and Forecasting (WMO-No. 702).

Product discipline 10 – Oceanographic products, parameter category 1: currents

Number	Parameter	Units
0	Current direction	degree true
1	Current speed	m s–1
2	u-component of current	m s–1
3	v-component of current	m s–1

Number	Parameter	Units
4–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 10 – Oceanographic products, parameter category 2: ice

Number	Parameter	Units
0	Ice cover	Proportion
1	Ice thickness	m
2	Direction of ice drift	degree true
3	Speed of ice drift	m s–1
4	u-component of ice drift	m s–1
5	v-component of ice drift	m s–1
6	Ice growth rate	m s–1
7	Ice divergence	s–1
8	Ice temperature	K
9	Module of ice internal pressure (see Note 1)	Pa m
10	Zonal vector component of vertically integrated ice internal pressure	Pa m
11	Meridional vector component of vertically integrated ice internal pressurei	Pa m
12	Compressive ice strength	N m–1
13–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Note:

1. Ice internal pressure or stress (Pa m) is the integrated pressure across the vertical thickness of a layer of ice. It is produced when concentrated ice reacts to external forces such as wind and ocean currents.

Product discipline 10 – Oceanographic products, parameter category 3: surface properties

Number	Parameter	Units
0	Water temperature	K
1	Deviation of`sea level from mean	m
2–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 10 – Oceanographic products, parameter category 4: subsurface properties

Number	Parameter	Units
0	Main thermocline depth	m
1	Main thermocline anomaly	m
2	Transient thermocline depth	m
3	Salinity	kg kg–1
4	Ocean vertical heat diffusivity	m2 s–1
5	Ocean vertical salt diffusivity	m2 s–1
6	Ocean vertical momentum diffusivity	m2 s–1
7	Bathymetry	m
8–10	Reserved	
11	Shape factor with respect to salinity profile	–
12	Shape factor with respect to temperature profile in thermocline	–
13	Attenuation coefficient of water with respect to solar radiation	m–1
14	Water depth	m
15	Water temperature	K
16–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Product discipline 10 – Oceanographic products, parameter category 191: miscellaneous

Number	Parameter	Units
0	Seconds prior to initial reference time (defined in Section 3)	s
1	Meridional overturning stream function	m3 s–1
2	Reserved	
3	Days since last observation	d
4–191	Reserved	
192–254	Reserved for local use	
255	Missing	

Code table 7.4 – Type of Interval

Code figure	Meaning
0	Smaller than first limit
1	Greater than second limit
2	Between first and second limit. The range includes the first limit but not the second limit
3	Greater than first limit
4	Smaller than second limit
5	Smaller or equal first limit
6	Greater or equal second limit
7	Between first and second. The range includes the first limit and the second limit
8	Greater or equal first limit
9	Smaller or equal second limit
10	Between first and second limit. The range includes the second limit but not the first limit
11	Equal to first limit
12–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.201 – Precipitation type

Code figure	Meaning
0	Reserved
1	Rain
2	Thunderstorm
3	Freezing rain
4	Mixed/ice
5	Snow
6	Wet snow
7	Mixture of rain and snow
8	Ice pellets
9	Graupel
10	Hail
11	Drizzle
12	Freezing drizzle
13–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.202 – Precipitable water category

Code figure	Meaning
0–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.203 – Cloud type

Code figure	Meaning
0	Clear
1	Cumulonimbus
2	Stratus
3	Stratocumulus
4	Cumulus
5	Altostratus

Code figure	Meaning
6	Nimbostratus
7	Altocumulus
8	Cirrostratus
9	Cirrocumulus
10	Cirrus
11	Cumulonimbus – ground-based fog beneath the lowest layer
12	Stratus – ground-based fog beneath the lowest layer
13	Stratocumulus – ground-based fog beneath the lowest layer
14	Cumulus – ground-based fog beneath the lowest layer
15	Altostratus – ground-based fog beneath the lowest layer
16	Nimbostratus – ground-based fog beneath the lowest layer
17	Altocumulus – ground-based fog beneath the lowest layer
18	Cirrostratus – ground-based fog beneath the lowest layer
19	Cirrocumulus – ground-based fog beneath the lowest layer
20	Cirrus – ground-based fog beneath the lowest layer
21–190	Reserved
191	Unknown
192–254	Reserved for local use
255	Missing

Note:

1. Code figures 11–20 indicate all four layers were used and ground-based fog is beneath the lowest layer.

Code table 7.204 – Thunderstorm coverage

Code figure	Meaning
0	None

Code figure	Meaning
1	Isolated (1–2%)
2	Few (3–5%)
3	Scattered (6–45%)
4	Numerous (> 45%)
5–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.205 – Presence of aerosol

Code figure	Meaning
0	Aerosol not present
1	Aerosol present
2–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.206 – Volcanic ash

Code figure	Meaning
0	Not present
1	Present
2–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.207 – Icing

Code figure	Meaning
0	None
1	Light
2	Moderate
3	Severe
4	Trace
5	Heavy

Code figure	Meaning
6–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.208 – Turbulence

Code figure	Meaning
0	None (smooth)
1	Light
2	Moderate
3	Severe
4	Extreme
5–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.209 – Planetary boundary-layer regime

Code figure	Meaning
0	Reserved
1	Stable
2	Mechanically driven turbulence
3	Forced convection
4	Free convection
5–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.210 – Contrail intensity

Code figure	Meaning
0	Contrail not present
1	Contrail present
2–191	Reserved
192–254	Reserved for local use

Code figure	Meaning
255	Missing

Code table 7.211 – Contrail engine type

Code figure	Meaning
0	Low bypass
1	High bypass
2	Non-bypass
3–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.212 – Land use

Code figure	Meaning
0	Reserved
1	Urban land
2	Agriculture
3	Range land
4	Deciduous forest
5	Coniferous forest
6	Forest/wetland
7	Water
8	Wetlands
9	Desert
10	Tundra
11	Ice
12	Tropical forest
13	Savannah
14–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.213 – Soil type

Code figure	Meaning
0	Reserved
1	Sand
2	Loamy sand
3	Sandy loam
4	Silt loam
5	Organic (redefined)
6	Sandy clay loam
7	Silt clay loam
8	Clay loam
9	Sandy clay
10	Silty clay
11	Clay
12–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.215 – Remotely sensed snow coverage

Code figure	Meaning
0–49	Reserved
50	No-snow/no-cloud
51–99	Reserved
100	Clouds
101–249	Reserved
250	Snow
251–254	Reserved for local use
255	Missing

Code table 7.216 – Elevation of snow-covered terrain

Code figure	Meaning
0–90	Elevation in increments of 100 m
91–190	Reserved

Code figure	Meaning
191	Clouds
192-254	Reserved for local use
255	Missing

Code table 7.217 – Cloud mask type

Code figure	Meaning
0	Clear over water
1	Clear over land
2	Cloud
3	No data
4–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.218 – Pixel scene type

Code figure	Meaning
0	No scene identified
1	Green needle-leafed forest
2	Green broad-leafed forest
3	Deciduous needle-leafed forest
4	Deciduous broad-leafed forest
5	Deciduous mixed forest
6	Closed shrub-land
7	Open shrub-land
8	Woody savannah
9	Savannah
10	Grassland
11	Permanent wetland
12	Cropland
13	Urban
14	Vegetation/crops
15	Permanent snow/ice
16	Barren desert

Code figure	Meaning
17	Water bodies
18	Tundra
19	Warm liquid water cloud
20	Supercooled liquid water cloud
21	Mixed-phase cloud
22	Optically thin ice cloud
23	Optically thick ice cloud
24	Multilayered cloud
25–96	Reserved
97	Snow/ice on land
98	Snow/ice on water
99	Sun-glint
100	General cloud
101	Low cloud/fog/Stratus
102	Low cloud/Stratocumulus
103	Low cloud/unknown type
104	Medium cloud/Nimbostratus
105	Medium cloud/Altostratus
106	Medium cloud/unknown type
107	High cloud/Cumulus
108	High cloud/Cirrus
109	High cloud/unknown
110	Unknown cloud type
111	Single Layer Water Cloud
112	Single Layer Ice Cloud
113–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.219 – Cloud top height quality indicator

Code figure	Meaning
0	Nominal cloud top height quality
1	Fog in segment

Code figure	Meaning
2	Poor quality height estimation
3	Fog in segment and poor quality height estimation
4–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.222 – Categorical result

Code figure	Meaning
0	No
1	Yes
2–191	Reserved
192–254	Reserved for local use
255	Missing

Code table 7.223 – Fire detection indicator

Code figure	Meaning
0	No fire detected
1	Possible fire detected
2	Probable fire detected
3-191	Reserved
192-254	Reserved for local use
255	Missing

Code table 7.224 – Categorical outlook

Code figure	Meaning
0	No risk area
1	Reserved
2	General thunderstorm risk area
3	Reserved
4	Slight risk area
5	Reserved

Code figure	Meaning
6	Moderate risk area
7	Reserved
8	High risk area
9–10	Reserved
11	Dry thunderstorm (dry lightning) risk area
12–13	Reserved
14	Critical risk area
15–17	Reserved
18	Extremely critical risk area
19–191	Reserved
192-254	Reserved for local use
255	Missing

Code table 7.225 – Weather

(see FM 94 BUFR/FM 95 CREX Code table 0 20 003 – Present weather)

Code table 7.227 – Icing scenario (weather/cloud classification)

Code figure	Meaning
0	None
1	General
2	Convective
3	Stratiform
4	Freezing
5–191	Reserved
192–254	Reserved for local use
255	Missing value

Code table 7.243 – Tile class

Code figure	Meaning
0	Reserved
1	Evergreen broadleaved forest

Code figure	Meaning
2	Deciduous broadleaved closed forest
3	Deciduous broadleaved open forest
4	Evergreen needle-leaf forest
5	Deciduous needle-leaf forest
6	Mixed leaf trees
7	Freshwater flooded trees
8	Saline water flooded trees
9	Mosaic tree/natural vegetation
10	Burnt tree cover
11	Evergreen shrubs closed-open
12	Deciduous shrubs closed-open
13	Herbaceous vegetation closed-open
14	Sparse herbaceous or grass
15	Flooded shrubs or herbaceous
16	Cultivated and managed areas
17	Mosaic crop/tree/natural vegetation
18	Mosaic crop/shrub/grass
19	Bare areas
20	Water
21	Snow and ice
22	Artificial surface
23	Ocean
24	Irrigated croplands
25	Rainfed croplands
26	Mosaic cropland (50–70%) – vegetation (20–50%)
27	Mosaic vegetation (50–70%) – cropland (20–50%)
28	Closed broadleaved evergreen forest
29	Closed needle-leaved evergreen forest
30	Open needle-leaved deciduous forest
31	Mixed broadleaved and needle-leaved forest
32	Mosaic shrubland (50–70%) – grassland (20–50%)
33	Mosaic grassland (50–70%) – shrubland (20–50%)

Code figure	Meaning
34	Closed to open shrubland
35	Sparse vegetation
36	Closed to open forest regularly flooded
37	Closed forest or shrubland permanently flooded
38	Closed to open grassland regularly flooded
39	Undefined
40–32767	Reserved
32768–	Reserved for local use

Code Tables used in Section 8 (Data Representation Section)

Code Table 8.0 – Data representation template number

Code figure	Meaning
0	Simple packing
1	IEEE floating point
2–49151	Reserved
49152–65534	Reserved for local use
65535	Missing

Code Table 8.1 – Type of original field values

Code figure	Meaning
0	Floating point
1	Integer
2–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 8.2 – Missing value management

Code figure	Meaning
0	No explicit missing values included within data values

Code figure	Meaning
1	Primary missing values included within data values
2	Primary and secondary missing values included within data values
3–191	Reserved
192–254	Reserved for local use
255	Missing

Code Table 8.3 – Precision of floating-point numbers

Code figure	Meaning
0	Reserved
1	IEEE 32-bit (I=4 in section 7)
2	IEEE 64-bit (I=8 in section 7)
3	IEEE 128-bit (I=16 in section 7)
4-191	Reserved
192–254	Reserved for local use
255	Missing

Code Tables used in Section 9 (Overlay Section)

Code Table 9.0 –Overlay template number

Code figure	Meaning
0	Bitmap
1–49151	Reserved
49152–65534	Reserved for local use
65535	Missing

Code Table 9.1 – Verification checksum algorithm

Code figure	Meaning
0	CRC32
1	MD5

Code figure	Meaning
2	SHA1
3-191	Reserved
192-254	Reserved for local use
255	Missing

Templates used in GRIB edition 3

Templates used in Section 3 (Time Domain Section)

Time Domain Template 3.0 – Forecast point in time

Component Code	Component Name
3.0	Forecast point in time

Time Domain Template 3.1 – Forecast time interval

Component Code	Component Name
3.1	Time interval

Time Domain Template 3.2 – Forecast two nested time intervals

Component Code	Component Name
3.1	Time interval (see note 1)
3.1	Time interval

Note:

1. Outer time interval first.

Time Domain Template 3.3 – Forecast three nested time intervals

Component Code	Component Name
3.1	Time interval (see note 1)
3.1	Time interval

Component Code	Component Name
3.1	Time interval

Note:

1. Outer time interval first.

Time Domain Template 3.4 – Forecast time interval with number of processed data values

Component code	Component Name
3.1	Time interval
3.2	Processed data in statistical process

Time Domain Template 3.5 – Forecast two nested time intervals with number of processed data values

Component code	Component Name
3.1	Time interval (Note 1)
3.2	Processed data in statistical process (Note 1)
3.1	Time interval
3.2	Processed data in statistical process

Note:

1. Outer time interval (including processed data in statistical process) first.

Time Domain Template 3.6 – Forecast three nested time intervals with number of processed data values

Component code	Component Name
3.1	Time interval (Note 1)
3.2	Processed data in statistical process (Note 1)
3.1	Time interval
3.2	Processed data in statistical process
3.1	Time interval
3.2	Processed data in statistical process

Note:

1. Outer time interval (including processed data in statistical process) first.

Templates used in Section 4 (Horizontal Domain Section)

Horizontal Domain Section Template 4.0 – Latitude/longitude regular grid on ellipsoidal planet

Component	Code Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.1	Latitude/longitude regular grid

Horizontal Domain Section Template 4.1 – Rotated latitude/longitude regular grid on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.1	Latitude/longitude regular grid
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.2 – Stretched latitude/longitude regular grid on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.1	Latitude/longitude regular grid
4.3	Stretching of latitude/longitude coordinate system

Horizontal Domain Section Template 4.3 – Stretched and rotated latitude/longitude regular grid on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.1	Latitude/longitude regular grid
4.2	Rotation of latitude/longitude coordinate system

Component Code	Component Name
4.3	Stretching of latitude/longitude coordinate system

Horizontal Domain Section Template 4.4 – Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.5	Periodic longitudes with number of points per parallel

Horizontal Domain Section Template 4.5 – Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel

Horizontal Domain Section Template 4.6 – Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.7	Non-periodic longitudes with number of points per parallel

Horizontal Domain Section Template 4.7 – Latitudes simple packing, regular Longitudes on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.9	Regular longitudes

Horizontal Domain Section Template 4.8 – Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.5	Periodic longitudes with number of points per parallel

Horizontal Domain Section Template 4.9 – Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel

Horizontal Domain Section Template 4.10 – Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths

Component Code	Component Name
4.8	Regular Latitudes
4.7	Non-periodic longitudes with number of points per parallel

Horizontal Domain Section Template 4.11 – Regular Latitudes, regular Longitudes on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.9	Regular longitudes

Horizontal Domain Section Template 4.12 – Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.5	Periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.13 – Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel
4.10	Selection of latitudes

Component Code	Component Name
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.14 – Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.7	Non-periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.15 – Latitudes simple packing, regular Longitudes on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.9	Regular longitudes
4.10	Selection of latitudes
4.11	Selection of longitudes

Horizontal Domain Section Template 4.16 – Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.5	Periodic longitudes with number of points per parallel
4.10	Selection of latitudes

Component Code	Component Name
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.17 – Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.18 – Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.7	Non-periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel

Horizontal Domain Section Template 4.19 – Regular Latitudes, regular Longitudes on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.9	Regular longitudes

Component Code	Component Name
4.10	Selection of latitudes
4.11	Selection of longitudes

Horizontal Domain Section Template 4.20 – Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.5	Periodic longitudes with number of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.21 – Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.22 – Rotated Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing

Component Code	Component Name
4.7	Non-periodic longitudes with number of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.23 – Rotated Latitudes simple packing, regular Longitudes on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.9	Regular longitudes
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.24 – Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.5	Periodic longitudes with number of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.25 – Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel

Component Code	Component Name
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.26 – Rotated Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.7	Non-periodic longitudes with number of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.27 – Rotated Regular Latitudes, regular Longitudes on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.9	Regular longitudes
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.28 – Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.5	Periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel

Component Code	Component Name
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.29 – Rotated Latitudes simple packing, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.30 – Rotated Latitudes simple packing, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.7	Non-periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.31 – Rotated Latitudes simple packing, regular Longitudes on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.4	Latitudes simple packing
4.9	Regular longitudes
4.10	Selection of latitudes
4.11	Selection of longitudes
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.32 – Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.5	Periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.33 – Rotated Regular Latitudes, Periodic Longitudes with number of points per parallel and longitude of first point per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.6	Periodic longitudes with number of points per parallel and longitude of first point per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.34 – Rotated Regular Latitudes, non-periodic Longitudes with number of points per parallel on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.7	Non-periodic longitudes with number of points per parallel
4.10	Selection of latitudes
4.12	Selection of points per parallel
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.35 – Rotated Regular Latitudes, regular Longitudes on ellipsoidal planet, sub-grid

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.8	Regular Latitudes
4.9	Regular longitudes
4.10	Selection of latitudes
4.11	Selection of longitudes
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Section Template 4.36 – Latitude/longitude unstructured mesh on ellipsoidal planet simple packing

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.13	Latitude/longitude unstructured grid simple packing

Horizontal Domain Section Template 4.37 – Rotated Latitude/longitude unstructured mesh on ellipsoidal planet simple packing

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.13	Latitude/longitude unstructured grid simple packing
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Template 4.38 – Latitude/longitude irregular grid on ellipsoidal planet simple packing

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.14	Latitude/longitude irregular grid simple packing

Horizontal Domain Template 4.39 – Rotated Latitude/longitude irregular grid on ellipsoidal planet simple packing

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.14	Latitude/longitude irregular grid simple packing
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Template 4.40 – Spherical harmonic coefficients on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.15	Spherical harmonic coefficients

Horizontal Domain Template 4.41 – Rotated Spherical harmonic coefficients on ellipsoidal planet

Component Code	Component Name
4.0	Ellipsoid of revolution defined with axis lengths
4.15	Spherical harmonic coefficients
4.2	Rotation of latitude/longitude coordinate system

Horizontal Domain Template 4.42 – URL

Component Code	Component Name
4.16	URL

Templates used in Section 5 (Vertical Domain Section)

Vertical Coordinate Template 5.0 – Vertical level

Component Code	Component Name
5.0	Vertical level (Single level)

Vertical Coordinate Template 5.1 – Vertical layer

Component Code	Component Name
5.1	Vertical layer (defined by 2 levels)

Vertical Coordinate Template 5.2 – Model level with list of parameters

Component Code	Component Name
5.2	Model level
5.3	Model level parameters list

Vertical Coordinate Template 5.3 – Model layer with list of parameters

Component Code	Component Name
5.2	Model level
5.2	Model level
5.3	Model level parameters list

Vertical Coordinate Template 5.4 – Model level with list of parameters and URL of auxiliary fields

Component Code	Component Name
5.2	Model level
5.3	Model level parameters list
5.4	URL of auxiliary fields for model levels

Vertical Coordinate Template 5.5 – Model level with URL of list of parameters and URL of auxiliary fields

Component Code	Component Name
5.2	Model level
5.5	URL of model level parameters list
5.4	URL of auxiliary fields for model levels

Vertical Coordinate Template 5.6 – Layer of model level with list of parameters and URL of auxiliary fields

Component Code	Component Name
5.2	Model level
5.2	Model level
5.3	Model level parameters list
5.4	URL of auxiliary fields for model levels

Vertical Coordinate Template 5.7 – Layer of model level with URL of list of parameters and URL of auxiliary fields

Component Code	Component Name
5.2	Model level
5.2	Model level
5.5	URL of model level parameters list
5.4	URL of auxiliary fields for model levels

Templates used in Section 6 (Generating Process Section)

Generating Process Template 6.0 – Forecast, analysis or observation

Component Code	Component Name
6.0	Process type and identifier

Generating Process Template 6.1 – Individual ensemble forecast or analysis

Component Code	Component Name
6.0	Process type and identifier
6.1	Ensemble size
6.2	Ensemble member

Generating Process Template 6.2 – Statistical post-processing of all ensemble members

Component Code	Component Name
6.0	Process type and identifier
6.1	Ensemble size
6.3	Statistical post-processing of ensemble members

Templates used in Section 7 (Observable Property Section)

Observable Property Template 7.0 – Observable property by discipline, category and number

Component Code	Component Name
7.0	Observable property by discipline, category and number

Observable Property Template 7.1 –Observable Property with units conversion

Component Code	Component Name
7.0	Observable property by discipline, category and number
7.1	Units conversion

Observable Property Template 7.2 – Atmospheric chemical or physical constituents

Component Code	Component Name
7.0	Observable property by discipline, category number
7.2	Chemical or physical constituents

Observable Property Template 7.3 – Aerosol physical property

Component Code	Component Name
7.0	Observable property by discipline, category number
7.2	Chemical or physical constituents
7.3	Aerosol size

Observable Property Template 7.4 – Aerosol optical property

Component Code	Component Name
7.0	Observable property by discipline, category and number
7.2	Chemical or physical constituents
7.3	Aerosol size
7.4	Radiation wavelength interval

Templates used in Section 8 (Data Representation Section)

Data Representation Template 8.0 – Simple packing

Component Code	Component Name
8.0	Simple packing

Data Representation Template 8.1 –IEEE floating point

Component Code	Component Name
8.1	IEEE floating point

Templates used in Section 9 (Overlay Section)

Overlay Template 9.0 – Bitmap

Component Code	Component Name
9.0	Bitmap

Overlay Template 9.1 - URL

Component Code	Component Name
9.1	URL

Template Components in GRIB edition 3

Templates Components used in Templates of Section 3 (Time Domain Section)

Template Component 3.0 – Forecast point in time

Byte no.	Content
1-2	Hours of observational data cut-off after reference time (see Note 1)

Byte no.	Content
3	Minutes of observational data cut-off after reference time
4	Indicator of unit of time range
5-8	Forecast time in units defined by byte 4

Note:

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

Template Component 3.1 – Forecast time interval

Byte No.	Content
1-2	Hours of observational data cut-off after reference time (see Note 1)
3	Minutes of observational data cut-off after reference time
4	Type of statistical processing (code table 3.4)
5	Indicator of unit of time range (see Code table 3.3)
6-9	Start of interval after reference time in units defined by byte 5
10	Indicator of unit of time range (see Code table 3.3)
11-14	Length of time range over which statistical processing is done in units defined by byte 10
15-16	Observable quantity units after statistical processing (code table 3.5)

Note:

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

Template Component 3.2 - Processed (included and missing) data in statistical process

Byte	Content
1-4	Total number of data values included in statistical process
5-8	Number of data values missing in statistical process

Components used in Templates of Section 4 (Horizontal Domain Section)

Horizontal Domain Template Component 4.0 – Ellipsoid of revolution defined with axis lengths

Byte No.	Contents
1	Scale factor of length of semi-major axis
2–5	Scaled value of length of semi-major axis (equatorial radius)
6	Scale factor of prime meridian offset
7–10	Scaled value of prime meridian offset (see Note 1)
11	Scale factor of length of semi-minor axis
12–15	Scaled value of length of semi-minor axis (distance from ellipsoid centre to pole)

Horizontal Domain Template Component 4.1 – Latitude/longitude regular grid

Byte No.	Contents
1–4	Ni – number of points along a parallel
5–8	Nj – number of points along a meridian
9–12	Basic angle of the initial production domain (see Note 1)
13–16	Subdivisions of basic angle used to define extreme longitudes and latitudes and direction increments (see Note 1)
17–20	La1 – latitude of first grid point (see Note 1)
21–24	Lo1 – longitude of first grid point (see Note 1)
25	Resolution and component flags (see Flag table 4.1)
26–29	La2 – latitude of last grid point (see Note 1)
30–33	Lo2 – longitude of last grid point (see Note 1)
34–37	Di – i direction increment (see Notes 1 and 2)
38–41	Dj – j direction increment (see Notes 1 and 2)

Byte No.	Contents
42	Scanning mode (flags – see Flag table 4.2)

Notes:

1. Basic angle of the initial production domain and subdivisions of this basic angle are provided to manage cases where the recommended unit of 10^{−6} degrees is not applicable to describe the extreme longitudes and latitudes, and direction increments. For these last six descriptors, the unit is equal to the ratio of the basic angle and the subdivisions number. For ordinary cases, zero and missing values should be coded, equivalent to respective values of 1 and 10^{6} (10^{−6} degrees unit).
2. Direction increments are unsigned and direction of increment is represented in the scanning mode.

Horizontal Domain Template Component 4.2 – Rotation of latitude/longitude coordinates system

Byte No.	Contents
1–4	Latitude of the southern pole of projection
5–8	Longitude of the southern pole of projection
9–12	Angle of rotation of projection

Note:

1. Three parameters define a general latitude/longitude coordinate system, formed by a general rotation of the sphere. One choice for these parameters is:
   a. The geographic latitude in degrees of the southern pole of the coordinate system, \theta_{p} for example;
   b. The geographic longitude in degrees of the southern pole of the coordinate system, \lambda_{p} for example;
   c. The angle of rotation in degrees about the new polar axis (measured clockwise when looking from the southern to the northern pole) of the coordinate system, assuming the new axis to have been obtained by first rotating the sphere through \lambda_{p} degrees about the geographic polar axis, and then rotating through (90 + \theta_{p}) degrees so that the southern pole moved along the (previously rotated) Greenwich meridian.

Horizontal Domain Template Component 4.3 – Stretching of latitude/longitude coordinates system

Byte No.	Contents
1–4	Latitude of the “pole of stretching”
5–8	Longitude of the ”pole of stretching”
9–12	Stretching factor

Note:

1. The stretching is defined by three parameters:
   a. The latitude in degrees (\lambda, measured in the model coordinate system) of the “pole of stretching”;
   b. The longitude in degrees (\theta, measured in the model coordinate system) of the “pole of stretching”; and
   c. The stretching factor C in units of 10^{−6} represented as an integer.

   The stretching is defined by representing data uniformly in a coordinate system with longitude \lambda and latitude \theta^{1}, where:

   ```
   \[\theta^{1} = \sin^{−1}(\frac{(1-C^{2})+(1+C^{2})\sin(\theta)}{(1+C^{2})+(1-C^{2})\sin(\theta)})\]
   ```

   and \lambda and \theta are longitude and latitude in a coordinate system in which the “pole of stretching” is the northern pole. C = 1 gives uniform resolution, while C \gt 1 gives enhanced resolution around the pole of stretching.

Horizontal Domain Template Component 4.4 – Latitudes simple packing

Byte No.	Contents
1-2	Number of parallels (2)
5	Latitudes Generating algorithm (code table 4.3)
6-13	Latitude Reference Value. (IEEE 64-bit floating-point)
14-15	Latitude Binary scale factor
16-17	Latitude Decimal scale factor
18	Number of bits used for each latitude value
19-20	Nblat - Number of bytes of latitude encoded data
21–Nblat	Latitude simple packing encoded data

Notes:

1. The template provides an ordered list of latitudes (parallels) and shall be combined with a definition of the longitudes per parallel.
2. Unsigned

Horizontal Domain Template Component 4.5 –Periodic Longitudes with number of points per parallel

Byte No.	Contents
1-8	Longitude of first point (IEEE 64-bit floating point)
9-10	NP - Number of parallels (1)
11-11+2*NP	Number of points per parallel

Note:

1. Unsigned

Horizontal Domain Template Component 4.6 – Periodic Longitudes with number of points per parallel and Longitude of first point per parallel

Byte No.	Contents
1-2	NP - Number of parallels (1)
5-5+2*NP	Number of points per parallel
6+NP-6+16*NP	Longitude of first point per parallel (IEEE 64-bit floating point)

Note:

1. Unsigned

Horizontal Domain Template Component 4.7 – Non-periodic Longitudes with number of points per parallel

Byte No.	Contents
1 - 2	NP - Number of parallels (2)
5 - 12	Longitude of first point per parallel (IEEE 64-bits floating point)
13 - 20	Longitude of last point per parallel (IEEE 64-bits floating point)
20 - 20 +2*NP	Number of points per parallel

Notes:

1. Longitude of first point per parallel shall not be equal to longitude of last point per parallel

2. Unsigned

Horizontal Domain Template Component 4.8 – Regular Latitudes

Byte No.	Contents
1-4	Nj – number of points along a meridian
5-8	Basic angle of the initial production domain (see Note 1)
9-12	Subdivisions of basic angle used to define extreme latitudes, and direction increments (see Note 1)
13-16	La1 – latitude of first grid point (see Note 1)
17	Resolution and component flags (see Flag table 4.1)
18-21	La2 – latitude of last grid point (see Note 1)
22-25	Dj – j direction increment (see Notes 1 and 2)

Notes:

1. Basic angle of the initial production domain and subdivisions of this basic angle are provided to manage cases where the recommended unit of 10^{-6} degrees is not applicable to describe the extreme longitudes and latitudes, and direction increments. For these last six descriptors, the unit is equal to the ratio of the basic angle and the subdivisions number.

   For ordinary cases, zero and missing values should be coded, equivalent to respective values of 1 and 10^{6} (10^{-6} degrees unit).

2. Direction increments are unsigned and direction of increment is represented in the scanning mode.

Horizontal Domain Template Component 4.9 – Regular longitudes

Byte No.	Contents
1-4	Ni – number of points along a parallel
9-12	Basic angle of the initial production domain (see Note 1)
13-16	Subdivisions of basic angle used to define extreme longitudes, and direction increments (see Note 1)
21-24	Lo1 – longitude of first grid point (see Note 1)

Byte No.	Contents
30-33	Lo2 – longitude of last grid point (see Note 1)
34-37	Di – i direction increment (see Notes 1 and 2)

1. Notes:
2. Basic angle of the initial production domain and subdivisions of this basic angle are provided to manage cases where the recommended unit of 10^{□6} degrees is not applicable to describe the extreme longitudes and latitudes, and direction increments. For these last six descriptors, the unit is equal to the ratio of the basic angle and the subdivisions number.

   For ordinary cases, zero and missing values should be coded, equivalent to respective values of 1 and 10^{6} (10^{□6} degrees unit).
3. Direction increments are unsigned and direction of increment is represented in the scanning mode.

Horizontal Domain Template Component 4.10 – Selection of latitudes

Byte No.	Contents
1-2	First latitude rank
3-4	Last latitude rank

Horizontal Domain Template Component 4.11 – Selection of points per parallel

Byte No.	Contents
1-2	First longitude rank
3-4	Last longitude rank

Note:

1. Unsigned

Horizontal Domain Template Component 4.12 – Selection of longitudes

Byte No.	Contents
1-2	NP - Number of parallels (1)
5-5+NP	Parallel first point ranks
5+NP-5+2*NP	Parallel last point ranks

Horizontal Domain Template Component 4.13 – Latitude/longitude unstructured mesh simple packing

Byte No.	Contents
1-4	Number of grid points
5-12	Longitude Reference Value. (IEEE 64-bit floating-point)
13-14	Longitude Binary scale factor
15-16	Longitude Decimal scale factor
17	Number of bits used for each longitude value
18-25	Latitude Reference Value. (IEEE 64-bit floating-point)
26-27	Latitude Binary scale factor
28-29	Latitude Decimal scale factor
30	Number of bits used for each latitude value
31-34	Nblon - Number of bytes of longitude encoded data
35–35+Nblon	Longitude simple packing encoded data
36+Nblon-37+Nblon	Nblat - Number of bytes of latitude encoded data
38+Nblon–38+Nblon+Nblat	Latitude simple packing encoded data

Horizontal Domain Template Component 4.14 – Latitude/longitude irregular grid simple packing

Byte No.	Contents
1-2	Ni - Number of columns (1)
3-4	Nj - Number of rows (1)
5-12	Longitude Reference Value. (IEEE 64-bit floating-point)
13-14	Longitude Binary scale factor
15-16	Longitude Decimal scale factor
17	Number of bits used for each longitude value
18-25	Latitude Reference Value. (IEEE 64-bit floating-point)
26-27	Latitude Binary scale factor
28-29	Latitude Decimal scale factor

Byte No.	Contents
30	Number of bits used for each latitude value
31-34	Nblon - Number of bytes of longitude encoded data
35–35+Nblon	Longitude simple packing encoded data
36+Nblon-37+Nblon	Nblat - Number of bytes of latitude encoded data
38+Nblon–38+Nblon+Nblat	Latitude simple packing encoded data

Note:

1. Unsigned

Horizontal Domain Template Component 4.15 – Spherical harmonic coefficients

Byte No.	Contents
1-2	J – pentagonal resolution parameter (1)
3-4	K – pentagonal resolution parameter (1)
5-6	M – pentagonal resolution parameter (1)
7	Representation type indicating the method used to define the norm (see Code table 4.4)
8	Representation mode indicating the order of the coefficients (see Code table 4.5)

Notes:

1. Unsigned
2. The pentagonal representation of resolution is general. Some common truncations are special cases of the pentagonal one:

   Triangular: `M = J = K`

   Rhomboidal: `K = J + M`

   Trapezoidal: `K = J, K > M`

Horizontal Domain Template Component 4.16 – URL

Byte No.	Contents
1-2	NURL - number of bytes used by the URL
3-3+NURL	URL (see Note 1)

Byte No.	Contents
4+NURL	verification checksum algorithm (Code Table 4.6)
5+NURL-5+NURL+NN	checksum (see Note 2)

Notes:

1. A URL is a Uniform Resource Locator that is identifying a web resource and is used in this context to locate and retrieve a GRIB message providing the template to be used. The syntax of the URL is:

   scheme://[host[:port]]/path[?query]

   where port and query are optional and can be missing.

2. The number of bytes NN is dictated by the verification checksum algorithm. Note that NN = 0 if the checksum algorithm is set to "missing".

Components used in Templates of Section 5 (Vertical Domain Section)

Vertical Coordinate Template Component 5.0 – Vertical level

Byte No.	Content
1	Type of first fixed surface (see Code Table 5.1)
2	Scale factor of first fixed surface
3–6	Scaled value of first fixed surface

Vertical Coordinate Template Component 5.1 – Vertical layer

Byte No.	Content
1	Type of first fixed surface (see Code Table 5.1)
2	Scale factor of first fixed surface
3–6	Scaled value of first fixed surface
7	Type of second fixed surface (see Code Table 5.1)
8	Scale factor of second fixed surface
9–12	Scaled value of second fixed surface

Vertical Coordinate Template Component 5.2 – Model level

Byte No.	Content
1-4	Model level

Vertical Coordinate Template Component 5.3 – Model level parameters list

Byte No.	Content
1-4	NP - Number of parameters
5	Algorithm to compute height, depth or pressure level (see Code Table 5.2)
6-6+NP*4	List of parameters (IEEE 32-bit floating-point)

Vertical Coordinate Template Component 5.4 – URL of auxiliary fields for model levels

Byte No.	Content
1-2	NURL - number of bytes used by the URL
3-3+NURL	URL (see Note 1)
4+NURL	verification checksum algorithm (see Code Table 5.3)
5+NURL-5+NURL+NN	checksum (see Note 2)

Notes:

1. A URL is a Uniform Resource Locator that is identifying a web resource and is used in this context to locate and retrieve a GRIB message providing the template to be used. The syntax of the URL is:

   scheme://[host[:port]]/path[?query]

   where port and query are optional and can be missing.

2. The number of bytes NN is dictated by the verification checksum algorithm. Note that NN = 0 if the checksum algorithm is set to "missing".

Vertical Coordinate Template Component 5.5 – URL of model level parameters list

Byte No.	Content
1-2	NURL - number of bytes used by the URL
3-3+NURL	URL (see Note 1)
4+NURL	verification checksum algorithm (see Code Table 5.3)
5+NURL-5+NURL+NN	checksum (see Note 2)

Notes:

1. A URL is a Uniform Resource Locator that is identifying a web resource and is used in this context to locate and retrieve a GRIB message providing the template to be used. The syntax of the URL is:

   scheme://[host[:port]]/path[?query]

   where port and query are optional and can be missing.

2. The number of bytes NN is dictated by the verification checksum algorithm. Note that NN = 0 if the checksum algorithm is set to "missing".

Components used in Templates of Section 6 (Generating Process Section)

Generating Process Template Component 6.0 – Process type and identifier

Byte No.	Content
1	Type of generating process (see Code Table 6.1)
2	Generating Process Identifier (managed by the originating Centre)

Generating Process Template Component 6.1 – Ensemble size

Byte No.	Content
1–2	Number of members in ensemble

Generating Process Template Component 6.2 – Ensemble member

Byte No.	Content
1	Type of ensemble member (see Code Table 6.2)
2–3	Member Number

Generating Process Template Component 6.3 – Statistical post-processing of all ensemble members

Byte No.	Content
1	Type of statistical post-processing of ensemble members (see Code Table 6.3)

Components used in Templates of Section 7 (Observable Property Section)

Observable Property Template Component 7.0 – Observable property by discipline, category and number

Byte No.	Content
1	Parameter Discipline (see Code Table 7.1)
2	Parameter Category (see Code Table 7.2)
3–4	Parameter Number (see Code Table 7.3)

Observable Property Template Component 7.1 – Units conversion

Byte No.	Content
1–4	Units conversion scale factor (ucs) (see Note 1)
5–8	Units conversion offset (uco) (see Note 1)

Notes:

1. Units conversion scale factor (ucs) and offset (uco) shall be used to encode fields in units different from the units reported in table 7.3. If the values encoded in the GRIB message are ve, the values v in the units provided in table 7.3 shall be: v=ucs * ve+ uco.
2. Encoded as IEEE 32 bits floating point values.

Observable Property Template Component 7.2 – Chemical or physical constituents

Byte No.	Content
1–2	Atmospheric chemical or physical constituent type (see Common Code Table C–14)

Observable Property Template Component 7.3 – Aerosol size

Byte No.	Content
1	Type of interval for first and second size (see Code Table 7.4)
2	Scale factor of first size
3–6	Scaled value of first size in metres
7	Scale factor of second size
8–11	Scaled value of second size in metres

Observable Property Template Component 7.4 – Radiation wavelength interval

Byte No.	Content
1	Type of interval for first and second wavelength (see Code Table 7.4)
2	Scale factor of first wavelength
3–6	Scaled value of first wavelength in metres
7	Scale factor of second wavelength
8–11	Scaled value of second wavelength in metres

Components used in templates of Section 8 (Data Representation Section)

Data Representation Template Component 8.0 – Simple packing

Byte No.	Content
1–4	Reference value ® (IEEE 32-bit floating-point value)
5–6	Binary scale factor (E)
7–8	Decimal scale factor (D)
9	Number of bits used for each packed value for simple packing, or for each group reference value for complex packing or spatial differencing
10	Type of original field values (see Code Table 8.1)
11	Missing value management (see Code Table 8.2)
12–15	Primary missing value substitute
16–19	Secondary missing value substitute

Notes:

1. Management of explicitly missing values is an alternative to bit-map use within Section 9; it is intended to reduce the whole GRIB message size and to provide better performance when decoding data with missing values.
2. There may be two types of missing value(s), such as to make a distinction between static misses (for instance, due to a land/sea mask) and occasional misses.
3. As an extra option, substitute value(s) for missing data may be specified. If not wished (or not applicable), all bits should be set to 1 for relevant substitute value(s).
4. If substitute value(s) are specified, type of content should be consistent with original field values (floating-point - and then IEEE 32-bit encoded-, or integer).
5. If primary missing values are used, such values are encoded with all bits set to 1 at packed data level.
6. If secondary missing values are used, such values are encoded with all bits set to 1, except the last one set to 0, at packed data level.

Data Representation Template Component 8.1 –IEEE floating point

Byte No.	Content
1	Precision (see Code Table 8.3)

Components used in Templates of Section 9 (Overlay Section)

Overlay Template Component 9.0 – Bitmap

Byte No.	Content
1–nn	Bitmap – Contiguous bits with a bit to data point correspondence, ordered as defined in Horizontal Domain Section. A bit set to 1 implies the presence of a data value at the corresponding data point, whereas a value of 0 implies the absence of such a value.

Overlay Template Component 9.1 – URL

Byte No.	Content
1-2	NURL - number of bytes used by the URL
3-3+NURL	URL (see Note 1)
4+NURL	verification checksum algorithm (see Code Table 9.1)
5+NURL-5+NURL+NN	checksum (see Note 2)

Notes:

1. A URL is a Uniform Resource Locator that is identifying a web resource and is used in this context to locate and retrieve a GRIB message providing the template to be used. The syntax of the URL is:

   scheme://[host[:port]]/path[?query]

   where port and query are optional and can be missing.

2. The number of bytes NN is dictated by the verification checksum algorithm. Note that NN = 0 if the checksum algorithm is set to "missing".