**AMENDMENTS TO MANUALS ON CODES AND THE GTS**

**BY THE FAST-TRACK PROCEDURE**

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**II. MANUAL ON THE GTS (WMO-NO. 386)**

None

**I. MANUAL ON CODES**

FM 92 GRIB:

**1. GRIB templates and tables entries to support specific issues of limited area models**[⮉](#FT2019_GRIB)

**ADD:**

Grid definition template 3.13 – Mercator with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15–nn | Same as grid definition template 3.10 |
| [nn+1]–[nn+4] | Nux – size of model forecast subdomain in x-direction (number of grid points) |
| [nn+5]–[nn+8] | Ncx – width of coupling area within forecast domain in x-direction (number of grid points) |
| [nn+9]–[nn+12] | Nuy – size of model forecast subdomain in y-direction (number of grid points) |
| [nn+13]–[nn+16] | Ncy – width of coupling area within forecast domain in y-direction (number of grid points) |

Grid definition template 3.23 – Polar stereographic with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15–65 | Same as grid definition template 3.20 |
| 66–69 | Nux – size of model forecast subdomain in x-direction (number of grid points) |
| 70–73 | Ncx – width of coupling area within forecast domain in x-direction (number of grid points) |
| 74–77 | Nuy – size of model forecast subdomain in y-direction (number of grid points) |
| 78–81 | Ncy – width of coupling area within forecast domain in y-direction (number of grid points) |

Grid definition template 3.33 – Lambert conformal with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15–81 | Same as grid definition template 3.30 |
| 82–85 | Nux – size of model forecast subdomain in x-direction (number of grid points) |
| 86–89 | Ncx – width of coupling area within forecast domain in x-direction (number of grid points) |
| 90–93 | Nuy – size of model forecast subdomain in y-direction (number of grid points) |
| 94–97 | Ncy – width of coupling area within forecast domain in y-direction (number of grid points) |

Grid definition template 3.61 – spectral Mercator with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15 | Spectral representation type (see Code table 3.6) |
| 16–19 | N – bi-Fourier resolution parameter |
| 20–23 | M – bi-Fourier resolution parameter |
| 24 | Bi-Fourier truncation type (see Code table 3.25) |
| 25–32 | Lx – size in meters of the domain along x-axis |
| 33–40 | Lux – size in meters of model forecast subdomain along x-axis |
| 41–48 | Lcx – width in meters of coupling area within forecast domain along x-axis |
| 49–56 | Ly – size in meters of the domain along y-axis |
| 57–64 | Luy – size in meters of model forecast subdomain along y-axis |
| 65–72 | Lcy – width in meters of coupling area within forecast domain along y-axis |
| 73 | Shape of the Earth (see Code table 3.2) |
| 74 | Scale factor of radius of spherical Earth |
| 75–78 | Scaled value of radius of spherical Earth |
| 79 | Scale factor of major axis of oblate spheroid Earth |
| 80–83 | Scaled value of major axis of oblate spheroid Earth |
| 84 | Scale factor of minor axis of oblate spheroid Earth |
| 85–88 | Scaled value of minor axis of oblate spheroid Earth |
| 89–92 | La1 – latitude of first grid point |
| 93–96 | Lo1 – longitude of first grid point |
| 97–100 | LaD – latitude(s) at which the Mercator projection intersects the Earth (latitude(s) where Di and Dj are specified) |
| 101–104 | La2 – latitude of last grid point |
| 105–108 | Lo2 – longitude of last grid point |
| 109–112 | Orientation of the grid, angle between i-direction on the map and the Equator (see Note 1) |

Note: Limited to the range of 0 to 90 degrees.

Grid definition template 3.62 – spectral polar stereographic with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15 | Spectral representation type (see Code table 3.6) |
| 16–19 | N – bi-Fourier resolution parameter |
| 20–23 | M – bi-Fourier resolution parameter |
| 24 | Bi-Fourier truncation type (see Code table 3.25) |
| 25–32 | Lx – size in meters of the domain along x-axis |
| 33–40 | Lux – size in meters of model forecast subdomain along x-axis |
| 41–48 | Lcx – width in meters of coupling area within forecast domain along x-axis |
| 49–56 | Ly – size in meters of the domain along y-axis |
| 57–64 | Luy – size in meters of model forecast subdomain along y-axis |
| 65–72 | Lcy – width in metres of coupling area within forecast domain along y-axis |
| 73 | Shape of the Earth (see Code table 3.2) |
| 74 | Scale factor of radius of spherical Earth |
| 75–78 | Scaled value of radius of spherical Earth |
| 79 | Scale factor of major axis of oblate spheroid Earth |
| 80–83 | Scaled value of major axis of oblate spheroid Earth |
| 84 | Scale factor of minor axis of oblate spheroid Earth |
| 85–88 | Scaled value of minor axis of oblate spheroid Earth |
| 89–92 | La1 – latitude of first grid point |
| 93–96 | Lo1 – longitude of first grid point |
| 97 | Resolution and component flags (see Flag table 3.3) |
| 98–101 | LaD – latitude where Dx and Dy are specified |
| 102–105 | LoV – orientation of the grid |
| 106 | Projection centre flag (see Flag table 3.5) |

Grid definition template 3.63 – spectral Lambert conformal with modelling subdomains definition

|  |  |
| --- | --- |
| Octet No. | Contents |
| 15 | Spectral representation type (see Code table 3.6) |
| 16–19 | N – bi-Fourier resolution parameter |
| 20–23 | M – bi-Fourier resolution parameter |
| 24 | Bi-Fourier truncation type (see Code table 3.25) |
| 25–32 | Lx – size in meters of the domain along x-axis |
| 33–40 | Lux – size in meters of model forecast subdomain along x-axis |
| 41–48 | Lcx – width in meters of coupling area within forecast domain along x-axis |
| 49–56 | Ly – size in meters of the domain along y-axis |
| 57–64 | Luy – size in meters of model forecast subdomain along y-axis |
| 65–72 | Lcy – width in meters of coupling area within forecast domain along y-axis |
| 73 | Shape of the Earth (see Code table 3.2) |
| 74 | Scale factor of radius of spherical Earth |
| 75–78 | Scaled value of radius of spherical Earth |
| 79 | Scale factor of major axis of oblate spheroid Earth |
| 80–83 | Scaled value of major axis of oblate spheroid Earth |
| 84 | Scale factor of minor axis of oblate spheroid Earth |
| 85–88 | Scaled value of minor axis of oblate spheroid Earth |
| 89–92 | La1 – latitude of first grid point |
| 93–96 | Lo1 – longitude of first grid point |
| 97–100 | LaD – latitude where Dx and Dy are specified |
| 101–104 | LoV – longitude of meridian parallel to y-axis along which latitude increases as the y-coordinate increases |
| 105 | Projection centre flag (see Flag table 3.5) |
| 106–109 | Latin 1 – first latitude from the pole at which the secant cone cuts the sphere |
| 110–113 | Latin 2 – second latitude from the pole at which the secant cone cuts the sphere |
| 114–117 | Latitude of the southern pole of projection |
| 118–121 | Longitude of the southern pole of projection |

Data representation template 5.53 – spectral data for limited area models – complex packing

|  |  |
| --- | --- |
| Octet No. | Contents |
| 12–15 | Reference value (R) (IEEE 32-bit floating-point value) |
| 16–17 | Binary scale factor (E) |
| 18–19 | Decimal scale factor (D) |
| 20 | Number of bits used for each packed value (field width) |
| 21 | Bi-Fourier sub-truncation type (see Code table 5.25) |
| 22 | Packing mode for axes (see Code table 5.26) |
| 23–26 | P – Laplacian scaling factor (expressed in 10–6 units) |
| 27–28 | NS – bi-Fourier resolution parameter of the unpacked subset (see Note 1) |
| 29–30 | MS – bi-Fourier resolution parameter of the unpacked subset (see Note 1) |
| 31–34 | TS – total number of values in the unpacked subset (see Note 1) |
| 35 | Precision of the unpacked subset (see Code table 5.7) |

Notes:

(1) The unpacked subset is a set of values defined in the same way as the full set of values (on a spectrum limited to NS and MS), but on which scaling and packing are not applied. Associated values are stored in octets 6 onwards of Section 7.

(2) The remaining coefficients are multiplied by (n2+m2)P, scaled and packed. The operator associated with this multiplication is derived from the Laplacian operator.

(3) The retrieval formula for a coefficient of wave number n is then: Y = (R + X x 2E) x 10–D x (m2+n2)–P where X is the packed scaled value associated with the coefficient.

Data template 7.53 – spectral data for limited area models – complex packing

|  |  |
| --- | --- |
| Octet No. | Contents |
| 6–(5+IxTS) | Data values from the unpacked subset (IEEE floating-point values on I octets) |
| (6+IxTS)–nn | Binary data values – binary string, with each (scaled) data value out of the unpacked subset |

**ADD:**

in Code table 3.1 – Grid definition template number,

|  |  |
| --- | --- |
| Code figure | Meaning |
| 13 | Mercator with modelling subdomains definition |
| 23 | Polar stereographic with modelling subdomains definition |
| 33 | Lambert conformal with modelling subdomains definition |
| 61 | Spectral Mercator with modelling subdomains definition |
| 62 | Spectral polar stereographic with modelling subdomains definition |
| 63 | Spectral Lambert conformal with modelling subdomains definition |

in Code table 3.6 – spectral data representation type,

|  |  |
| --- | --- |
| Code figure | Meaning |
| 2 | Bi-Fourier representation |

in Code table 3.25 – type of bi-Fourier truncation,

|  |  |
| --- | --- |
| Code figure | Meaning |
| 77 | Rectangular |
| 88 | Elliptic |
| 99 | Diamond |

in Code table 5.0 – data representation template number,

|  |  |
| --- | --- |
| Code figure | Meaning |
| 53 | Spectral data for limited area models – complex packing |

in Code table 5.25 – type of bi-Fourier subtruncation,

|  |  |
| --- | --- |
| Code figure | Meaning |
| 77 | Rectangular |
| 88 | Elliptic |
| 99 | Diamond |

in Code table 5.26 – packing mode for axes

|  |  |
| --- | --- |
| Code figure | Meaning |
| 0 | Spectral coefficients for axes are packed |
| 1 | Spectral coefficients for axes included in the unpacked subset |

**2. Additional parameters for waves products**[⮉](#FT2019_GRIB)

**ADD:**

in Code table 4.2, Product discipline 10 – Oceanographic products, parameter category 0: waves

|  |  |  |  |
| --- | --- | --- | --- |
| Code | Name  | Units | Description  |
| 56 | Wave directional width of first swell partition | - | Relative spread of the distribution in direction of the waves belonging to swell partition 1 |
| 57 | Wave directional width of second swell partition | - | Relative spread of the distribution in direction of the waves belonging to swell partition 2 |
| 58 | Wave directional width of third swell partition | - | Relative spread of the distribution in direction of the waves belonging to swell partition 3 |
| 59 | Wave frequency width of first swell partition | - | Relative spread of the distribution in frequency of the waves belonging to swell partition 1 |
| 60 | Wave frequency width of second swell partition | - | Relative spread of the distribution in frequency of the waves belonging to swell partition 2 |
| 61 | Wave frequency width of third swell partition | - | Relative spread of the distribution in frequency of the waves belonging to swell partition 3 |
| 62 | Wave frequency width | - | Relative spread of the distribution in frequency of all waves in the spectrum |
| 63 | Frequency width of wind waves | - | Relative spread of the distribution in frequency of all waves classified as wind waves |
| 64 | Frequency width of total swell | - | Relative spread of the distribution in frequency of all waves classified as swell |

**3. New code for atmosphere composition modelling**[⮉](#FT2019_GRIB)

**ADD:**

in the Code table 4.2, Product discipline 0 – Meteorological products, parameter category 20: atmospheric chemical constituents,

|  |  |  |
| --- | --- | --- |
| Number | Parameter | Units |
| 15 | Dry deposition velocity | m s–1 |
| 16 | Mass mixing ratio with respect to dry air | kg kg–1 |
| 17 | Mass mixing ratio with respect to wet air | kg kg–1 |
| 18–49 | Reserved |
| ... | ... |  |
| 64 | Mole fraction with respect to dry air | mol mol–1 |
| 65 | Mole fraction with respect to wet air | mol mol–1 |
| 66 | Column-integrated in-cloud scavenging rate by precipitation | kg m–2 s–1 |
| 67 | Column-integrated below-cloud scavenging rate by precipitation | kg m–2 s–1 |
| 68 | Column-integrated release rate from evaporating precipitation | kg m–2 s–1 |
| 69 | Column-integrated in-cloud scavenging rate by large-scale precipitation | kg m–2 s–1 |
| 70 | Column-integrated below-cloud scavenging rate by large-scale precipitation | kg m–2 s–1 |
| 71 | Column-integrated release rate from evaporating large-scale precipitation | kg m–2 s–1 |
| 72 | Column-integrated in-cloud scavenging rate by convective precipitation | kg m–2 s–1 |
| 73 | Column-integrated below-cloud scavenging rate by convective precipitation | kg m–2 s–1 |
| 74 | Column-integrated release rate from evaporating convective precipitation | kg m–2 s–1 |
| 75 | Wildfire flux | kg m–2 s–1 |
| 76–99 | Reserved |  |

in Common Code table C-14,

|  |  |  |
| --- | --- | --- |
| Code figure | Meaning | Chemical fomula |
| 39 | Nitryl chloride | NO2Cl |
| 40 | Sulphuric acid | H2SO4 |
| 41 | Hydrogen sulphide | H2S |
| 42 | Sulphur trioxide | SO3 |
| 43 | Bromine | Br2 |
| 44 | Hydrofluoric acid | HF |
| 45 | Sulphur hexafluoride | SF6 |
| 46 | Dichlorine | Cl2 |
|  |  |  |
| 10024 | Methanesulphonic acid | CH3SO3H |
| 10025 | Methylglyoxal | CH3C(O)CHO |
| 10026 | Peroxyacetyl radical | CH3C(O)OO• |
| 10027 | Methacrylic acid | CH2C(CH3)COOH |
| 10028 | Methacrolein | CH2C(CH3)CHO |
| 10029 | Acetone | (CH3)2CO |
| 10030 | Ethyl dioxidanyl radical | CH3CH2OO• |
| 10031 | Butadiene | (CH2CH)2 |
| 10032 | Acetaldehyde | CH3CHO |
| 10033 | Glycolaldehyde | HOCH2CHO |
| 10034 | Cresol (all isomers) | CH3PhOH |
| 10035 | Peracetic acid | CH3C(O)OOH |
| 10036 | 2-hydroxyethyl oxidanyl radical | HOCH2CH2O• |
| 10037 | 2-hydroxyethyl dioxidanyl radical | HOCH2CH2OO• |
| 10038 | Glyoxal | OCHCHO |
| 10039 | Isopropyl dioxidanyl radical | (CH3)2CHOO• |
| 10040 | Isopropyl hydroperoxide | (CH3)2CHOOH |
| 10041 | Hydroxyacetone | CH3C(O)CH2OH |
| 10042 | Peroxyacetic acid | CH3C(O)OOH |
| 10043 | Methyl vinyl ketone | CH3C(O)CHCH2 |
| 10044 | Phenoxy radical | PhO• |
| 10045 | Methyl radical | CH3• |
| 10046 | Carbonyl sulphide | OCS |
| 10047 | Dibromomethane | CH2Br2 |
| 10048 | Methoxy radical | CH3O |
| 10049 | Tribromomethane | CHBr3 |
| 10050 | Formyl radical | HOC• |
| 10051 | Hydroxymethyl dioxidanyl radical | HOCH2OO• |
| 10052 | Ethyl hydroperoxide | CH3CH2OOH |
| 10053 | 3-hydroxypropyl dioxidanyl radical | HOCH2CH2CH2OO• |
| 10054 | 3-hydroxypropyl hydroperoxide | HOCH2CH2CH2OOH |
|  |  |
| 10501 | DMSO | (CH3)2SO |
|  |  |
| 20022 | HCFC141a | CH3CClF2 |
|  |  |
| 30295 | Carbon 13 | C-13 |
| 30296 | Lead (natural abundance) | Pb |
|  |  |
| 40000 | Singlet sigma dioxygen | O2(1Σ+g) |
| 40001 | Singlet delta dioxygen | O2(1Δg) |
| 40002 | singlet excited oxygen atom | O(1D) |
| 40003 | triplet ground state atom | O(3P) |
|  |  |
| 60018 | Aldehydes | RCHO |
| 60019 | Peroxides | R-OOH |
| 60020 | Organic nitrates | R-NO3 |
| 60021 | Ethers | ROR’ |
| 60022 | Amines | NRR’R’’ |
| 60023 | Ketones | RC(O)R’ |
| 60024 | Dicarbonyls unsaturated | RC(O)CH2C(O)R’ |
| 60025 | Hydroxy dicarbonyls unsaturated | RC(O)CHOHC(O)R’ |
| 60026 | Hydroxy ketone | RC(OH)C(O)R’ |
| 60027 | Oxides | Ox |
|  |  |
| 62028 | Total aerosol hydrophilic |
| 62029 | Total aerosol hydrophobic |

**4. Additional parameters for ocean products**[⮉](#FT2019_GRIB)

**ADD:**

in the Code table 4.2, Product discipline 10 – Oceanographic products, parameter category 4: subsurface properties,

|  |  |  |
| --- | --- | --- |
| Number | Parameter | Units |
| 16 | Water density (rho) | kg m-3 |
| 17 | Scaled water density (sigma) | kg m-3 |
| 18 | Water potential temperature (theta) | K |
| 19 | Water potential density (rho theta) | kg m-3 |
| 20 | Scaled water potential density (sigma theta) | kg m-3 |
| 21 | Practical salinity | psu (numeric) |

FM 94 BUFR

**5. New BUFR sequence for the reporting of basic ship AWS data**[⮉](#FT2019_BUFR)

**ADD:**

in BUFR Table D,

**Category 08 – Surface report sequences (sea)**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Sequence for reporting of basic ship AWS observations |  |
| 3 08 018 | 3 01 150 | WIGOS Identifier |  |
|  | 3 01 093 | Ship identification, movement, date/time, horizontal and vertical coordinates |  |
|  | 3 02 001 | Pressure and 3-hour pressure change |  |
|  | 3 02 072 | Temperature and humidity data |  |
|  | 1 01 000 | Delayed replication of 1 descriptor |  |
|  | 0 31 000 | Short delayed descriptor replication factor |  |
|  | 3 02 056 | Sea/water temperature |  |
|  | 1 01 000 | Delayed replication of 1 descriptor |  |
|  | 0 31 000 | Short delayed descriptor replication factor |  |
|  | 3 02 064 | Ship or other marine platform wind data |  |

Common code tables

**6. Amendment to Common Code table C-2 by Russian Federation**[⮉](#FT2019_Common)

**ADD:**

in Common Code table C-2,

 08/05/2019 19 119 ​  Polus-MRZ-N1 (Russian Federation)

**7. New entry in Common Code table C-8 by EUMETSAT**[⮉](#FT2019_Common)

**ADD:**

in Common Code table C-8

604 NOAA Radiometer HIRS/1 High-resolution infrared sounder/1

**8. New entries in Common Code table C-12 by Brazil**[⮉](#FT2019_Common)

**ADD:**

in Common Code Table C-12,

46 Brazilian Space Agency - INPE 18 SIPAM-Porto Velho-RO

46 Brazilian Space Agency - INPE 19 SIPAM-Belém-PA

**AMEND:**

in Common Code Table C-12,

46 Brazilian Space Agency - INPE 12 Brasilia (SEPIS – INMET)

**9. New entries in Common Code tables C-1, C-11 and C-12 by Brazil**[⮉](#FT2019_Common)

**ADD:**

in Common Code table C-1 and C-11,

148 Brazilian Department of Airspace Control - DECEA

in Common Code table C-12,

148 Brazilian Department of Airspace Control - DECEA

 1 Integrated Center of Aeronautical Meteorology - CIMAER

**10. Amendment to Common Code table C-2 by Germany**[⮉](#FT2019_Common)

**ADD:**

in the Common Code table C-2,

 08/05/2019 54 154 ​  Graw DFM-17 (Germany)