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| WORLD METEOROLOGICAL ORGANIZATIONCOMMISSION FOR BASIC SYSTEMS-----------------------------FOURTH MEETING OF INTER-PROGRAMME EXPERT TEAM ONDATA REPRESENTATION MAINTENANCE AND MONITORINGGENEVA, SWITZERLAND, 30 MAY - 3 JUNE 2016 |  | IPET-DRMM-IV / Doc. 2.2 (2)(13. 5. 2016)-------------------------ITEM 2.2ENGLISH ONLY |

GRIB

**New GRIB template for post-processed NWP output**

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**Summary and Purpose of Document**

New GRIB template for post-processed NWP output from multiple sources. The template needs to identify:

1) which model has produced the original NWP output,

2) which Centre has produced the original NWP output as distinguished by the Centre performing the post-processing

3) which post-processing technique was used.

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**ACTION PROPOSED**

The team is requested to validate the proposed new templates and include them for publication in November with FT2016-2, at this purpose sample data are provided.

**ATTACHEMENTS**

1. File prostprocessing\_samples.tgz containing GRIB examples of the proposed templates and their dump with ecCodes.

**DISCUSSIONS**

Since 2011, The European Flood Awareness System (EFAS) has been part of the Copernicus Emergency Management Service (EMS). Several centres, run by European organisations, are responsible for producing and providing the flood information. ECMWF is responsible for running the forecasts, post-processing, hosting the EFAS information system platform as well as archiving the hydrological output. The output consists of ensemble forecasts of several hydrological and water balance parameters.

EFAS helps to protect European citizens, the environment, property and cultural heritage when major floods occur. It has been developed and tested at the Joint Research Centre (JRC) of the European Commission, in close collaboration with national hydrological and meteorological services, European civil protection agencies through the Emergency Response and Coordination Centre (ERCC), and other research institutes. It provides pan-European overview maps of flood probabilities up to 15 days in advance, and detailed forecasts at stations where the national services are providing real-time data. More than 50 hydrological services and civil protection services in Europe are part of the EFAS network.

Most hydrological services rely either on observations only or on short-term deterministic rainfall forecasts of up to two days or less because the high degree of uncertainty in weather forecasts at longer lead times. Since these uncertainties are also unpredictable, they render the results unreliable and therefore not useful for decision making. EFAS uses multiple weather forecasts and EPS as input, and the variables used as input are temperature, precipitation and evaporation.

The hydrological model used for EFAS is LISFLOOD. The model is a hybrid between a conceptual and a physical rainfall-runoff model combined with a routing module in the river channel. A hydrological model can in all intents and purposes be seen as a post-processing of forcing data. In order to store the output from LISFLOOD and still retain the information on which NWP model and which meteorological centre that produced the forecast, we therefore propose 4 new templates for post-processing. These templates are designed to be flexible and generic and can therefore be applied to any type post-processing techniques of NWP output. The templates should be able to handle information on the NWP model used, which institute produced the output and which post-processing technique was used. The templates are proposed for analysis/deterministic and ensemble forecasts, and for instantaneous and accumulated variables.

**PROPOSAL**

**New Templates**

The following four new GRIB templates are proposed:

***Product definition template 4.70 – Post-processing analysis or forecast at a horizontal level or in a horizontal layer at a point in time***

Octet No. Contents

10 Parameter category (see Code table 4.1)

11 Parameter number (see Code table 4.2)
12-13 Input Process Identifier (See Note 1)
14-15 Input Originating Centre (See Common Code Table C-11 and Note 2)
16 Type of Post-processing (See Note 3)

17 Type of generating process (see Code table 4.3)

18 Background generating process identifier (defined by originating centre)

19 Analysis or forecast generating process identifier (defined by originating centre)

20–21 Hours of observational data cut-off after reference time (see Note 4)

22 Minutes of observational data cut-off after reference time

23 Indicator of unit of time range (see Code table 4.4)

24–27 Forecast time in units defined by octet 23

28 Type of first fixed surface (see Code table 4.5)

29 Scale factor of first fixed surface

30–33 Scaled value of first fixed surface

34 Type of second fixed surface (see Code table 4.5)

35 Scale factor of second fixed surface

36-39 Scaled value of second fixed surface

Notes:
(1) This identifies which model produced the NWP output. This is defined by the originating centre.
(2) This identifies which centre produced the original NWP output as distinguished by the centre performing the post-processing.

(3) This identifies which post-processing technique was used. This is defined by the originating centre.
(4) Hours greater than 65534 will be coded as 65534.

***Product definition template 4.71 – Post-processing individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal layer at a point in time***

Octet No. Contents

10 Parameter category (see Code table 4.1)
11 Parameter number (see Code table 4.2)
12-13 Input Process Identifier (See Note 1)
14-15 Input Originating Centre (See Common Code Table C-11 and Note 2)
16 Type of Post-processing (See Note 3)

17 Type of generating process (see Code table 4.3)

18 Background generating process identifier (defined by originating centre)

19 Forecast generating process identifier (defined by originating centre)

20–21 Hours after reference time of data cut-off (see Note 4)

22 Minutes after reference time of data cut-off

23 Indicator of unit of time range (see Code table 4.4)

23–27 Forecast time in units defined by octet 23

28 Type of first fixed surface (see Code table 4.5)

29 Scale factor of first fixed surface

30–33 Scaled value of first fixed surface

34 Type of second fixed surface (see Code table 4.5)

35 Scale factor of second fixed surface

36–39 Scaled value of second fixed surface

40 Type of ensemble forecast (see Code table 4.6)

41 Perturbation number

42 Number of forecasts in ensemble

Notes:
(1) This identifies which model produced the NWP output. This is defined by the originating centre.
(2) This identifies which centre produced the original NWP output as distinguished by the centre performing the post-processing.

(3) This identifies which post-processing technique was used. This is defined by the originating centre.
(4) Hours greater than 65534 will be coded as 65534.

***Product definition template 4.72 – Post-processing average, accumulation, extreme values or other statistically processed values at a horizontal level or in a horizontal layer in a continuous or non-continuous time interval***

Octet No. Contents

10 Parameter category (see Code table 4.1)

11 Parameter number (see Code table 4.2)

12-13 Input Process Identifier (See Note 1)
14-15 Input Originating Centre (See Common Code Table C-11 and Note 2)
16 Type of Post-processing (See Note 3)
17 Type of generating process (see Code table 4.3)

18 Background generating process identifier (defined by originating centre)

19 Analysis or forecast generating process identifier (defined by originating centre)

20–21 Hours after reference time of data cut-off (see Note 4)

22 Minutes after reference time of data cut-off

23 Indicator of unit of time range (see Code table 4.4)

24–27 Forecast time in units defined by octet 23 (see Note 5)

28 Type of first fixed surface (see Code table 4.5)

29 Scale factor of first fixed surface

30–33 Scaled value of first fixed surface

34 Type of second fixed surface (see Code table 4.5)

35 Scale factor of second fixed surface

36–39 Scaled value of second fixed surface

40–41 Year

42 Month

43 Day

Time of end of overall time interval

44 Hour

45 Minute

46 Second

47 n – number of time range specifications describing the time intervals used to calculate the statistically processed field

48–51 Total number of data values missing in statistical process

52–63 Specification of the outermost (or only) time range over which statistical processing is done

52 Statistical process used to calculate the processed field from the field at each time increment during the time range
(see Code table 4.10)

53 Type of time increment between successive fields used in the statistical processing (see Code table 4.11)

54 Indicator of unit of time for time range over which statistical processing is done (see Code table 4.4)

55–58 Length of the time range over which statistical processing is done, in units defined by the previous octet

59 Indicator of unit of time for the increment between the successive fields used (see Code table 4.4)

60–63 Time increment between successive fields, in units defined by the previous octet (see Notes 6 and 7)

64–nn These octets are included only if n > 1, where nn = 51 + 12 x n

64–75 As octets 52 to 63, next innermost step of processing

76–nn Additional time range specifications, included in accordance with the value of n. Contents as octets 52 to 63, repeated as necessary

Notes:

(1) This identifies which model produced the NWP output. This is defined by the originating centre.
(2) This identifies which centre produced the original NWP output as distinguished by the centre performing the post-processing.

(3) This identifies which post-processing technique was used. This is defined by the originating centre.
(4) Hours greater than 65534 will be coded as 65534.

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

(6) An increment of zero means that the statistical processing is the result of a continuous (or near continuous) process, not the processing of a number of discrete samples. Examples of such continuous processes are the temperatures measured by analogue maximum and minimum thermometers or thermographs, and the rainfall measured by a rain gauge.

(7) The reference and forecast times are successively set to their initial values plus or minus the increment, as defined by the type of time increment (one of octets 63, 65, 77, ...). For all but the innermost (last) time range, the next inner range is then processed using these reference and forecast times as the initial reference and forecast times.

***Product definition template 4.73 – Post-processing individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal layer, in a continuous or non- continuous time interval***

Octet No. Contents

10 Parameter category (see Code table 4.1)

11 Parameter number (see Code table 4.2)
12-13 Input Process Identifier (See Note 1)
14-15 Input Originating Centre (See Common Code Table C-11 and Note 2)
16 Type of Post-processing (See Note 3)

17 Type of generating process (see Code table 4.3)

18 Background generating process identifier (defined by originating centre)

19 Forecast generating process identifier (defined by originating centre)

20–21 Hours after reference time of data cut-off (see Note 4)

22 Minutes after reference time of data cut-off

23 Indicator of unit of time range (see Code table 4.4)

24–27 Forecast time in units defined by octet 23 (see Note 5)

28 Type of first fixed surface (see Code table 4.5)

29 Scale factor of first fixed surface

30–33 Scaled value of first fixed surface

34 Type of second fixed surface (see Code table 4.5)

35 Scale factor of second fixed surface

36–39 Scaled value of second fixed surface

40 Type of ensemble forecast (see Code table 4.6)

41 Perturbation number

42 Number of forecasts in ensemble

43–44 Year of end of overall time interval

45 Month of end of overall time interval

46 Day of end of overall time interval

47 Hour of end of overall time interval

48 Minute of end of overall time interval

49 Second of end of overall time interval

50 n – number of time range specifications describing the time intervals used to calculate the statistically processed field

51–54 Total number of data values missing in statistical process

55–66 Specification of the outermost (or only) time range over which statistical processing is done

55 Statistical process used to calculate the processed field from the field at each time increment during the time range (see Code table 4.10)

56 Type of time increment between successive fields used in the statistical processing (see Code table 4.11)

57 Indicator of unit of time for time range over which statistical processing is done (see Code table 4.4)

58–61 Length of the time range over which statistical processing is done, in units defined by the previous octet

62 Indicator of unit of time for the increment between the successive fields used (see Code table 4.4)

63–66 Time increment between successive fields, in units defined by the previous octet (see Note 6)

67–nn These octets are included only if n > 1, where nn = 54 + 12 x n

62–73 As octets 55 to 66, next innermost step of processing

74–nn Additional time range specifications, included in accordance with the value of n. Contents as octets 55 to 66, repeated as necessary

Notes:

(1) This identifies which model produced the NWP output. This is defined by the originating centre.
(2) This identifies which centre produced the original NWP output as distinguished by the centre performing the post-processing.

(3) This identifies which post-processing technique was used. This is defined by the originating centre.
(4) Hours greater than 65534 will be coded as 65534.

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

(6) An increment of zero means that the statistical processing is the result of a continuous (or near continuous) process, not the processing of a number of discrete samples. Examples of such continuous processes are the temperatures measured by analogue maximum and minimum thermometers or thermographs, and the rainfall measured by a rain gauge. The reference and forecast times are successively set to their initial values plus or minus the increment, as defined by the type of time increment (one of octets 56, 68, 80, ...). For all but the innermost (last) time range, the next inner range is then processed using these reference and forecast times as the initial reference and forecast times

**New entries in Code Table 4.0**

The following entries are to be added to Code table 4.0:

Code Meaning

70 Post-processing analysis or forecast at a horizontal level or in a horizontal layer at a point in time
71 Post-processing individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal layer at a point in time
72 Post-processing average, accumulation, extreme values or other statistically processed values at a horizontal level or in a horizontal layer in a continuous or non-continuous time interval
73 Post-processing individual ensemble forecast, control and perturbed, at a horizontal level or in a horizontal layer, in a continuous or non-continuous time interval