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| WORLD METEOROLOGICAL ORGANIZATION  COMMISSION FOR BASIC SYSTEMS  -----------------------------  SECOND MEETING OF  INTER-PROGRAMME EXPERT TEAM ON CODES MAINTENANCE  OFFENBACH, GERMANY, 28 MAY - 1 JUNE 2018 |  | IPET-CM-II / Doc. 2.6(4)  23.05.2018  -------------------------  ITEM 2.6  ENGLISH ONLY |

MANUAL ON CODES: TABLE-DRIVEN CODE FORMS

New editions of Table-Driven Code Forms

New template components and templates for model level in GRIB Edition 3

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**Summary and Purpose of Document**

A review of the proposed template and template components for model level has caused a discussion on new template components for vertical grid identifier and resulting templates.

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**ACTION PROPOSED**

The TT-GRIB is asked to review the proposal and accept it for validation.

**ANNEXES:**

**DISCUSSIONS**

To define model levels the following template components and templates were introduced at the last meeting:

VDTC 5.2 Model level parameters list (including code table CT 5.2 for computing algorithm)

VDTC 5.4 Model level

VDTC 5.3 URL of auxiliary fields

VDCT 5.5 URL of model parameter list

From these template components the following templates were built for model levels:

VDT 5.2 Model level with list of parameters and URL of auxiliary fields

VDT 5.3 Model level with URL of list of parameters and URL of auxiliary field and the same for layers (VDT 5.5 und VDT 5.6).

At a first glance it is noticed that for model level the code table 5.1 “Fixed surface type and unit” seems to be replaced by code table 5.2, the “Algorithm to compute height, depth or pressure level”.

We would like to extend the title of code table 5.2 as follows: “Algorithm to compute height, depth, pressure or any other model level”

We also see a problem in the fact, that the code figure from CT 5.2 is unknown, if the model level parameter list is provided via URL (VDT 5.3).

The sole information of model level (number) is useless without any other information like total number of levels and the computing algorithm.

As for horizontal domain the usage of URL has to go along with additional identifier for the vertical grid.

Another issue is to define the “general vertical coordinate”, already implemented in GRIB2 and used by all DWD models. The concept of general vertical coordinates becomes more and more important, as the algorithm to compute the model levels become more complicated. In future the constructing of adaptive vertical grids, varying in time, will be an issue to be solved.

Therefore we think about a - general - template component providing vertical model level grid identifier, also needed in case of URL usage for model level definitions.

Remark without proposal:

All proposed templates for model level use the auxiliary fields only in URL form. This is problematic in case of surface pressure needed in computing algorithm. Surface pressure is changing every output time and it is a common output field. Therefore we feel that there is no need to put it in several “URL GRIB messages”. This means definition of new templates without URL of auxiliary fields.

**PROPOSAL**

It was stated, that the proposals and especially code table 5.2 need to be exactly defined by experts.

The following proposals are regarded as contributions to a possible solution and to enhance the discussion.

First we propose to split the computing algorithm and the parameter list: extract “algorithm” from template component VDTC 5.2 and put it into another (new) template component.

Then VDTC 5.2 looks like (with correction in offset):

***NEW (modified): VDTC 5.2 – Model level parameters list***

|  |  |
| --- | --- |
| **Byte No**. | **Contents** |
| 1-4 | NP – number of parameters |
| 5 – 4+NP\*4 | List of parameters (IEEE 32-bit floating –point) |

With “algorithm” in new template component:

***NEW: VDTC 5.x – Meta data for vertical coordinates (vertical grid identifier for model level)***

|  |  |
| --- | --- |
| **Byte No**. | **Contents** |
| 1-3 | Number of vertical grid (defined by originating center, Note 1) |
| 4 | Number of vertical grid in reference (Vertical staggering, code table 5.x) |
| 5-6 | Total number of vertical levels (according to code table 5.x) |
| 7 | Algorithm to compute height, depth, pressure or any other model level (code table 5.2) |
| 8 | Direction of increasing coordinate numbering (code table 5.y) |
| 9-24 | Fingerprint (unique identifier) |
|  |  |
| Note (1) | Identification number of vertical grid (Can be missing, but necessary in case of missing model level parameters or if a URL is used) |
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|  |  |
| ***Code table 5.x*** | ***Vertical staggering*** |
|  |  |
| **Code** | **Meaning** |
| 0 | half level |
| 1 | full level |
| 2 | half levels given, full levels coded as layers between half levels |
| 3 | full levels given, half levels coded as layers between full levels |
| 255 | missing |
|  |  |
| ***Code table 5.y*** | ***Direction of increasing coordinate numbering*** |
|  |  |
| **Code** | **Meaning** |
| 0 | up |
| 1 | down |
| 255 | missing |
|  |  |

NEW VDT 5.2, 5.3, 5.5 and 5.6 (remove old ones):

***VDT 5.2 – Model level with list of parameters and URL of auxiliary fields***

***TC Content***

5.4 Level

5.x Meta data for vertical coordinate

5.2 Model level parameter list

99.0 Auxiliary fields URL

***VDT 5.3 – Model level with URL of list of parameters and URL of auxiliary fields***

***TC Content***

5.4 Level

5.x Meta data for vertical coordinate

99.0 Model level parameter list URL

99.0 Auxiliary fields URL

***VDT 5.5 – Layer of model level with list of parameters and URL of auxiliary fields***

***TC Content***

5.4 Level

5.4 Level

5.x Meta data for vertical coordinate

5.2 Model level parameter list

99.0 Auxiliary fields URL

***VDT 5.6 – Layer of model level with URL of list of parameters and URL of auxiliary fields***

***TC Content***

5.4 Level

5.4 Level

5.x Meta data for vertical coordinate

99.0 Model level parameter list URL

99.0 Auxiliary fields URL

Templates without URL of auxiliary fields could be the above ones without “Auxiliary fields URL”.

To define the “general vertical coordinate”, we propose the following templates:

***VDT 5.x – General vertical coordinate: model level***

***TC Content***

5.4 Level

5.x Meta data for vertical coordinate

***VDT 5.6 – General vertical coordinate: layer of model level***

***TC Content***

5.4 Level

5.4 Level

5.x Meta data for vertical coordinate

with new entry in code table 5.2 :

“Algorithm to compute height, depth, pressure or any other model level”

|  |  |
| --- | --- |
| ***Code table 5.2*** | ***Algorithm to compute height, depth or pressure or any other model level*** |
|  |  |
| **Code** | **Meaning** |
| 0 | The atmosphere is divided into NLEV layers. These layers are defined by the pressures at the interfaces between them (the 'half-levels'), and these pressures are given by  pk+1/2 = Ak+1/2 + Bk+1/2 ps (1)  for 0 ≤ k ≤ NLEV. The Ak+1/2 and Bk+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 Bk+1/2 for all 0 ≤ k ≤ NLEV are the list of parameters and ps is the auxiliary field needed to compute the pressure pk associated with each model level (middle of layer) from  pk = 1/2 (pk−1/2 + pk+1/2) with 1 ≤ k ≤ NLEV by using (1) and the surface pressure field. |
| … | … |
| 150 | The computing algorithm is not given. The model level heights related to mean see level are given explicitly, coded as height with discipline 0, parameter category 3 and parameter number 6. |
| … | … |
| 255 | missing |

May be these proposals do not serve as general ones for “all” possible applications, but we feel confident that they are a base for validation or at least a trigger for new discussions.