**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR BASIC SYSTEMS**

**FOURTH MEETING OF THE INTER-PROGRAMME EXPERT TEAM**

**ON DATA REPRESENTATION MAINTENANCE AND MONITORING**

**FINAL REPORT**

**GENEVA, SWITZERLAND, 30 MAY - 3 JUNE 2016**

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**Executive Summary**

The fourth meeting of the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) took place at the WMO Headquarters in Geneva, Switzerland from 30 May to 3 June 2016.

The meeting reviewed the proposals already under validation or submitted at the meeting on GRIB edition 2 (GRIB2), BUFR and CREX in the Manual on Codes (WMO-No. 306). It agreed 17 proposals have been duly validated or non-controversial. These proposals are to be forwarded to the appropriate formalities (fast-track or adoption between CBS sessions), which are as summarized below:

– GRIB2 for tropical cyclone forecast, unbalanced components, pollen forecast, wildfire-driven pollution, new compression method, GRAPES model products and negative forecast time,

– BUFR/CREX for dropsonde parachute, VOS observation data and radiosounding metadata reporting, and

– Common code tables for radiosonde identifiers, and satellite and instrument identifiers.

In addition, the meeting confirmed that some proposals will be validated by centres concerned urgently after the meeting and to be forwarded to the next fast-track procedure (FT2016-2), which are for post-processed NWP output, new ensemble products (GRIB2), C-band synthetic aperture radar instrument data, DWD radar products, geographic coordinate and coordinate reference systems (BUFR).

The meeting also agreed the amendments to the Attachment II-5 of Manual on the GTS (WMO-No. 386) for fast-track, which are to introduce new designators for XML representation of tropical cyclone, volcanic ash and AIRMET report.

The minor amendment to aviation weather reporting (METAR, SPECI) based on the Amendment 77 to ICAO Annex 3 was withdrawn by ICAO. Nothing is to be done at the moment for these code forms, while the Amendment 77 itself will be implemented in November 2016.

With regard to the GRIB new edition, the meeting noted requirements for GRIB edition 3 had been collected and reviewed during the last four years. It decided to submit GRIB edition 3 to the 16th session of CBS to be approved for experimental use.

The meeting agreed that introducing GRIB edition 3 for experimental use should in the similar way as for CREX, which was adopted by the extraordinary session of CBS in 1994 (general summary 5.4.27 of CBS Ext.(94)).

With regard to BUFR edition 5, requirements have been collected as well. In accordance with the impact and the short time left to propose BUFR edition 5 for the 16th session of CBS, it decided to focus on feature requests that would provide improvements with lesser impacts.

The meeting agreed BUFR edition 4 could continue for the time being as “fit for purpose” but not ideal. Once BUFR edition 5 has been more precisely defined, the intention will be to introduce it for experimental use, possibly at the 17th session of CBS. Thereafter, BUFR edition 4 and 5 will be maintained in parallel for the medium term.

The *Procedures for Maintaining Manuals and Guides Managed by the Commission for Basic Systems* (Rec.15 (CBS-Ext.(2014))) was revised by EC-68 to involve the President of WMO and to clarify its applicable range. The meeting recognized that time for approval of amendments will be longer than now.

The meeting reviewed the tasks (TOR) of IPET-DRMM, referring to the draft list prepared by CBS Management Group and to be finalized by ICT-ISS. It noticed missing tasks that they have accepted so far and accordingly requested the new tasks to be in the TOR of the team, which are maintenance of GTS abbreviated headings (Manual on the GTS) and plotting symbols (to be moved from Manual on the GDPFS).

With respect to the migration to TDCF, the meeting noted good progress made in some regions and for some type of BUFR reports, while recognizing no good progress for climate data. The meeting reviewed with interest the status report of the CBS Management Group Task Team on upper-air BUFR data. The meeting agreed to contribute to the paper drafted by the TT on benefits of using TDCF from the perspective of NWP centres.

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**FOURTH MEETING OF THE INTER-PROGRAMME EXPERT TEAM**

**ON DATA REPRESENTATION MAINTENANCE AND MONTORING**

**(GENEVA, SWITZERLAND, 30 MAY - 3 JUNE 2016)**

# 1. ORGANIZATION OF THE MEETING

# 1.1 Opening of the meeting[⮉](#Cont_1)

The fourth meeting of the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) took place at the Headquarters of WMO in Geneva, Switzerland from 30 May to 3 June 2016.

Mr Peiliang Shi, Director of the WMO Information System Branch, OBS Department of WMO, welcomed the participants of the meeting on behalf of the Secretary-General of WMO. Mr Shi thanked the participants for their work not only during the meetings but also between meetings by correspondence. He highlighted two issues: the new working structure of Commission for Basic Systems (CBS) discussed by the CBS Management Group and the CBS technical conference (TECO), to which he invited the participant contributions.

Dr Simon Elliott, chairperson of IPET-DRMM, expressed gratitude for seeing the participants again. Dr Elliott focussed on the new editions of GRIB and BUFR, i.e. the framework, idea or fully functioning code form, to be submitted to the coming meeting of CBS Implementation Coordination Team on Information Systems and Services (ICT-ISS).

# 1.2 Approval of the agenda[⮉](#Cont_1)

The meeting agreed on the agenda without additional one, which is shown in the [**Annex**](#A2016_1_2) to this paragraph along with the list of participants.

# 1.3 Working arrangement[⮉](#Cont_1)

Dr Simon Elliott presented the working plan to the participants. It was confirmed that no possible teleconferences are expected and a long time is assigned to the issue of GRIB and BUFR new editions.

The meeting agreed with the working plan.

# 2. GRIB

# 2.1 Amendments to GRIB regulations

(no proposal)

# 2.2 Additions to and modifications of templates and tables

### 2.2.1 New parameter for tropical cyclone forecasts[⮉](#Cont_2)

The U.S. Hurricane Weather Research and Forecasting (HWRF) model is used to track and forecast tropical cyclone activity in the Northern Atlantic and Eastern Pacific basins, and it is collaboratively maintained between [National Oceanic and Atmospheric Administration](http://www.noaa.gov/) (NOAA) and other parts of the U.S. meteorological community including several universities. The heat exchange coefficient, which is a unitless indicator of the interaction between the ocean and the atmosphere, is a significant factor in the determination of the strength and development of tropical cyclones.

Mr Jeffrey Ator, NOAA/National Weather Service (NWS)/[National Centres for Environmental Prediction (NCEP)](http://www.ncep.noaa.gov/), which manages the operational runs of the HWRF model, proposed the *heat exchange coefficient* in GRIB2, code table 4.2. The new outputs are to assist the research community that has continually worked to help improve the model.

The meeting agreed the proposal for FT2016-2 without comments as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_1) to this paragraph.

In relation to the approval by the fast-track procedure, it was notified that additional process was expected to the procedure by the coming Executive Council session. In view of the whole process necessary for the final adoption, the deadline of validation for FT2016-2 would be the end of June.

### 2.2.2 New GRIB template for post-processed NWP output[⮉](#Cont_2)

Since 2011, the European Flood Awareness System (EFAS) has been part of the Copernicus Emergency Management Service (EMS). EFAS helps to protect European citizens, the environment, property and cultural heritage when major floods occur.

The European Centre for Medium-Range Weather Forecasts (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.

Dr Enrico Fucile, ECMWF, proposed four new GRIB2 templates for post-processing, which are designed to be flexible and generic and can therefore be applied to several types of post-processing techniques of NWP output. The meeting noted the important role of the outputs, which will contribute to the longer range flood forecasting in Europe.

The meeting thanked ECMWF for the initiative and agreed the proposal for validation as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_2) to this paragraph. Mr Yves Pelletier, Meteorological Service of Canada (MSC), noted MSC could use the similar products.

Additionally, the meeting agreed the proposal for FT2016-2, provided the validation exercise will be completed.

### 2.2.3 New GRIB table entries (unbalanced components)[⮉](#Cont_2)

Dr Enrico Fucile, ECMWF, proposed a set of “unbalanced" residuals of several parameters already in code table 4.2. It aims for the benefit of the NWP community.

Dr Fucile explained the unbalanced residuals are obtained by subtracting the “balanced” part from the total physical quantities. As an example, the ageostrophic wind (unbalanced) results from subtracting the geostrophic wind (balanced) from the full wind.

Dr Fucile further explained the main application was in the analysis as only relevant analysis variables are suggested at this time, with the potential to add more analysis related variables at a later stage.

The meeting recognized the background of the proposal and agreed the proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_3) to this paragraph.

In this relation, it was asked how to manage the information on "description" in the tables. It was suggested a column to the tables for descriptions could be introduced unofficially and made available from the web.

### 2.2.4 Amendments in Common Table C-14 for Pollen, new parameters in Table 4.2 and new entries in Table 4.5[⮉](#Cont_2)

The ART module (Aerosols and Reactive Trace gases, Vogel et al., 2009), that can be coupled with Deutscher Wetterdienst (DWD) models COSMO and ICON, is used for specific applications of chemical constituents like volcanic ash, mineral dust and pollen.

Ms Sibylle Krebber, DWD, requested entries in common table C-14 and GRIB code tables 4.2 and 4.5 to encode these products.

Ms Krebber added that pollen forecasts are performed to inform and warn the public since different types of pollen are released during the year, some of which are allergenic and may cause health problems. The ART module operated by [MétéoSuisse](http://www.meteosuisse.admin.ch/) provides pollen concentration for several species.

The meeting noted that pollen forecasts are generated only for alder (Alnus), birch (Betula), ragweed (Ambrosia) and grass (Poaceae) at the moment, and the comprehensive list of pollen species was proposed for future implementations and also for BUFR/CREX as well.

The meeting agreed the proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_4) to this paragraph, in which only entries required at the moment for pollen forecast are included.

### 2.2.5 New generating process and common codes to represent wildfire-driven pollution in air quality models[⮉](#Cont_2)

Air quality modelling systems can greatly benefit from the ingestion of wildfire emissions, providing a more accurate representation of pollutants present in the atmosphere. In addition, the cross-border nature of air pollution increasingly requires timely and accurate data exchange between bordering authorities.

Mr Yves Pelletier, MSC, proposed the new generating process for GRIB code table 4.3 to describe the method used in the Canadian Fire Work system: two instances of the same online Chemical Transport Model (CTM), one with forest fire source terms and one without, are subtracted to produce a field containing only the contribution of forest fires.

Mr Pelletier also proposed entries in common code table C-14, which are aerosol size categories of atmospheric particulate matter that are widely reported and forecasted in the field of air quality.

It was recognized that size could be specified in GRIB templates 4.44 to 4.47. Mr Pelletier accepted to propose one entry without size definition.

The meeting agreed the revised proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_5) to this paragraph.

### 2.2.6 Update of GRIB2 new compression method – CCSDS libaec[⮉](#Cont_2)

Consultative Committee for Space Data Systems recommends a Golomb-Rice encoding scheme which is efficient in terms of size and encoding size for transmitting gridded data. In tests with meteorological data, it has been shown that this algorithm can be effectively applied to data from numerical weather prediction models. It has long been desired to be able to use this algorithm in GRIB and a proposed template implementing this has now been validated.

The template for CCSDS encoding has been in circulation in various forms since 2008 (proposed at the Joint Meeting of Expert Team on Data Representation and Codes and Coordination Team on Migration to Table Driven Code Forms). The proposed template was changed from the form proposed at the first meeting of IPET-DRMM in order to better fit the community’s needs:

a) The proposed data representation template 5.42 was reduced to a smaller number of entries. This was done because they were not needed for encoding and decoding the values in section 7.

b) The entries “reference sample interval” and “block size” were added, matching the documentation in [2] on the algorithm’s implementation, as well as the library used for validation.

Ms Sibylle Krebber, DWD, reported the meeting that the proposal has been duly validated and ready for operational use.

Ms Krebber notified that this compression method is better than JPEG2000.

It was the consensus that this template (DRT 5.42) is valid only for the version 2, reviewing carefully the text in the octet 22 and notes of DRT 5.42.

The meeting agreed the proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_6) to this paragraph.

*Editorial note: [2] Consultative Committee for Space Data Systems: Lossless Data Compression. CCSDS Recommendation for Space Data System Standards, CCSDS 121.0-B-2, Blue Book, May 2012.*

### 2.2.7 New ensemble templates and one ensemble template correction[⮉](#Cont_2)

DWD encodes forecast products of volcanic ash, mineral dust or other aerosols with product definition templates 4.40 (chemical constituents), 4.48 (optical properties of aerosol) and 4.57 (chemical constituents based on a distribution function). In the near future, these forecasts will also be done in ensemble mode. With PDT 4.41 the ensemble template is provided for chemical constituents. But the ensemble pendants for the others are missing.

Ms Sibylle Krebber, DWD, proposed ensemble extension of PDT 4.48 and 4.57.

Ms Krebber asked the meeting if the typo in PDT 4.56 for ensemble products of tile parameters could be corrected or a new template PDT 4.59 should be introduced.

The meeting agreed the proposed templates for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_7) to this paragraph including the PDT 4.59 to be used instead of 4.56, if validation is completed. The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) will endeavour to support the validation.

### 2.2.8 Encoding fields from Limited Area models combining conformal projections and bi-periodic spectral geometry[⮉](#Cont_2)

Mr Yann Genin, Météo-France, presented the technical aspects which are specific to AROME and ALADIN limited area models and proposed new templates for validation to encode fields produced by these models, describing:

a) the theoretical background necessary to understand the details that may be important to justify the evolution of the standard requested in this document,

b) the evolutions required to encode limited area grid-point fields, which are only slight modifications of already existing templates, and

c) the evolutions required to encode limited area spectral fields.

With regard to use of these templates, Mr Genin expressed the main needs are within Météo-France and they can be used for operational model and research experiment.

The meeting agreed the proposal for validation as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_8) to this paragraph, recognizing ECMWF will assist the validation.

### 2.2.9 New table entries for GRIB2 to represent GRAPES model products[⮉](#Cont_2)

GRAPES (Global/Regional Assimilation and PrEdiction System) is the numerical weather prediction model developed by China Meteorological Administration (CMA). GRAPES\_MESO was developed in 2001 and operational running in 2008. The horizontal resolution is 0.1\*0.1 degree, the total number of vertical level is 50, and the maximum forecast time is 84 hours. GRAPES\_GFS was developed in 2007 and pre-operational running in 2009, and would be operational running in 2016. The horizontal resolution is 0.25\*0.25 degree, the total number of vertical level is 60, and the maximum forecast time is 240 hours.

Ms Fang Zhao, CMA, proposed new entries needed in code tables 4.2 and 4.5 to encode GRAPES\_MESO and GRAPES\_GFS products in GRIB2.

It was felt the new entry, sigma height level, should be clearly differentiated from sigma level in the code table 4.5. In view of this, and since the "description" in the proposal will not be included in the code table officially, a new note to the entry should be created.

The meeting agreed the revised proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_2_9) to this paragraph.

# 2.3 GRIB new edition

# 2.3.1 GRIB edition 3[⮉](#Cont_2)

Requirements for the next GRIB edition has been collected during the last four years. The list has been consolidated and a cost/benefit analysis presented during the previous meeting of IPET-DRMM. During that meeting, it has been decided to implement only a small consolidated set of requirements to be confident that the new GRIB edition could be submitted for approval at the sixteenth session of CBS in 2016.

A collaborative work space has been made available by ECMWF for the consolidation of the new GRIB edition 3 structure. A work of consolidation of the structure has been completed and the necessary changes have been drafted in a proposed new version of the Manual on Codes for FM-92 GRIB.

It was noted that most of the requirements would be implemented in the new proposed structure.

Some points for discussion were suggested, which are compulsory use of GRIB3, availability of software to handle GRIB3, reference implementation of GRIB3 and a document for selling GRIB3 to managements.

Dr Enrico Fucile, ECMWF, as the Lead of TT-GRIB, has lead and consolidated the discussion at plenary and breakout discussions.

The conclusion is as in the [**Annex I**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_3_1_I) to this paragraph.

In accordance with the conclusion, the meeting drafted the GRIB edition 3 for experimental use (see editorial note below).

The meeting agreed that introducing GRIB edition 3 for experimental use should in the similar way as for CREX, which was adopted by the extraordinary session of CBS in 1994 (general summary 5.4.27 of CBS Ext.(94)).

*Editorial note: The draft GRIB edition 3 was further refined by teleconference held on 5 July 2016. The draft is available from* [**Annex II**](file:///\\internal.wmo.int\userdata\redirected\AShimazaki\WORKPLACE\MEETING\IPET-DRMM\IPET-DRMMIv_Geneva2016\Report\Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_2_3_1_II)*.*

# 3. BUFR AND CREX

# 3.1 Amendments to BUFR/CREX regulations

# 3.1.1 Specifying the operands of a multivariate operator[⮉](#Cont_3)

At the third meeting IPET-DRMM in Beijing (2015) a requirement was expressed for a means to convey information, within a BUFR sequence, to specify the operands of a given descriptor conveying the result of an operation on two or more fields.

For instance, it was explained that some weather radar data may contain the results of a correlation operator, and that the operands of the correlation may vary from one instance to another. It may not be obvious to determine which descriptors convey the operands in each specific case. The mechanism that provides this information must unambiguously identify both the operation and the operands.

Mr Yves Pelletier, MSC, presented two operators for discussion in the framework of BUFR edition 5 to cope with above issue.

The meeting reviewed the proposed two operators referring to the example in the proposal from several viewpoints to understand how the operators work.

The meeting concluded that the proposal will be under further review for the future edition, which is shown in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_1_1) to this paragraph for reference.

# 3.2 Additions to and modifications of tables

# 3.2.1 New entries in common code table C-2 by Switzerland and Kazakhstan[⮉](#Cont_3)

MétéoSuisse will introduce a new radiosonde at Payerne station. The focal point for codes and data representation matters of Switzerland, Ms Estelle Grüter, has requested a new entry in the common code table C-2 to be available as from November 2016.

Kazakhstan is preparing a formal request on a new entry for the radiosonde (it has been sent to the Secretariat during the meeting).

Mr Jeffrey Ator, NOAA/NWS, requested four entries in the C-2 for dropsonde to be used in United States (see 3.2.2 New entries for dropsonde data). These are for U.S. University Corporation for Atmospheric Research (UCAR).

The meeting reviewed above requests together to discuss the common issue on the table C-2.

The meeting had a concern on the table C-2 almost saturated, and asked everyone to consider assigning entries reserved for BUFR. Mr Ator agreed to assign the four new U.S. entries from 190 to 193.

The meeting agreed the proposals for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_1) to this paragraph.

# 3.2.2 New entries for dropsonde data[⮉](#Cont_3)

Mr Jeffrey Ator, NOAA/NWS, in addition to the new entries in the table C-2 (see 3.2.1 above), proposed a new BUFR table B entry describing the size of the dropsonde parachute.

The meeting agreed the proposal for FT2016-2 without comments as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_2) to this paragraph.

With respect to dropsonde reporting, United States seeks clarification on a regulation in B/C26. Regulation B/C26.5 states that “Temperature, dewpoint and wind data at pressure levels obtained during the dropsonde descent shall be included in descending order with respect to pressure.”. However, the net effect is that, in the resulting BUFR message, the levels end up being reported as though the profile was ascending (i.e. splash level first, corresponding to the highest pressure, and release point from the aircraft last, corresponding to the lowest pressure) and with the timestamp decreasing at each successive level.

Mr Ator asked the meeting to confirm that this is indeed the intended outcome. The meeting noted what Mr Ator pointed out but the consensus was that it should be consistent with the current regulations.

# 3.2.3 New entries in Common Tables C-5 and C-8[⮉](#Cont_3)

### 3.2.8 New entries in Common Code Table C-5

# Dr Enrico Fucile, ECMWF, jointly with Dr Simon Elliott, EUMETSAT, submitted new entries in common code table C-5 for satellite:

– Sentinel 5P (<http://www.wmo-sat.info/oscar/satellites/view/402>),

– Sentinel 1 (<https://www.wmo-sat.info/oscar/satelliteprogrammes/view/145>),

– SCISAT-1 (<http://www.wmo-sat.info/oscar/satellites/view/393>) and

– ODIN (<http://www.wmo-sat.info/oscar/satellites/view/34>)

and new entries in common code table C-8 for the following instruments:

– Tropospheric Monitoring Instrument ([http://www.wmo-sat.info/oscar/instruments/view/  
586](http://www.wmo-sat.info/oscar/instruments/view/586))

– Atmospheric Chemistry Experiment - Fourier Transform Spectrometer (http://www.wmo-sat.info/oscar/instruments/view/6)

– Sub-millimetre radiometer (http://www.wmo-sat.info/oscar/instruments/view/524)

Mr Jeffrey Ator, NOAA/NWS, requested four new entries in common code table C-5 for the next generation of GOES satellites currently scheduled for launch in early November 2016.

Ms Fang Zhao, CMA, also made a proposal on a new entry in the table C-5 for the FY-3D polar-orbiting satellite of China to be launched at the end of 2016.

The meeting noted that the proposal by Dr Fucile had been submitted to CGMS for validation and the codes confirmed, which would justify the proposal submitted by organizations other than owner of the satellites or instruments.

The meeting agreed the proposals for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_3) to this paragraph.

In relation to the proposals, it was requested to make these information available from OSCAR database. The Secretariat will discuss the feasibility with the staff in charge.

*Editorial note: after the meeting USA has submitted two additional entries as specified* [**here**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_3_add)*, which is non-controversial and agreed by the chair of IPET-DRMM in view of no comments from members.*

### 3.2.4 New BUFR elements for C-band synthetic aperture radar instrument (C-SAR)[⮉](#Cont_3)

ECMWF is preparing for the operational processing of Sentinel 1 Ocean Swell Wave (OSW) data. Sentinel-1 is the first in the new fleet of European Space Agency (ESA) Sentinels satellites and carries an advanced C-band Synthetic Aperture Radar (SAR) instrument to provide an all-weather, day-and-night supply of imagery of Earth’s surface.

Dr Enrico Fucile, ECMWF, informed the meeting that ECMWF had developed in collaboration with ESA a new BUFR sequence for the level L2 data to support ESA in the definition of the Sentinel 1 OSW data in BUFR which are of interest for the data assimilation in NWP models and exchanging Sentinel 1 OSW data activities.

Dr Fucile proposed new entries in the BUFR/CREX Table B, class 03, 05, 25, 40. Noting that class 22 (Oceanographic elements) is full, he also proposed Class 42 as an extension.

Dr Fucile will try to complete the validation of the proposal in association with CGMS for adoption by FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_4) to this paragraph.

### 3.2.5 Comments from Czech Republic[⮉](#Cont_3)

In accordance with the "Procedures for Maintaining Manuals and Guides Managed by the Commission for Basic Systems" (Resolution 21 (Cg-17)) effective from 1 January 2016, the Secretariat dispatched the circular letter (PR-6892) with draft amendments to the Manual on Codes, Volume I.2 to all WMO Members on 7 March 2016, in which amendments to Annex II to B/C25 Regulations are included.

In response to the circular letter, the focal point for codes and data representation matters of Czech Republic, Ms Barbora Klikova, has submitted comments by Czech Republic.

The meeting reviewed carefully the comments (questions and proposals) from Czech Republic one by one, drafting texts to be shown to the focal point, which are in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_5) to this paragraph.

### 3.2.6 BUFR Sequence for synoptic reports from sea stations suitable for VOS observation data (editorial changes)[⮉](#Cont_3)

The BUFR elements and sequences for reporting VOS observations in BUFR on the GTS have previously been approved for validation. The validation was performed in December 2016 and the proposed changes were due to be implemented in FT2016-1. However, two editorial changes were proposed during the fast-track process, one a change of name for sequence 3 06 043 and the other the addition of a note to sequence 3 01 018 on the use of encrypted call sign or WMO identifier for VOS reports. Consequently, following discussion, the implementation has been delayed to enable these changes to be made.

Dr David Bery, representative from WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), re-submitted the updated proposal. Dr Berry emphasized the changes are editorial in nature and should not effect the validation status.

The meeting agreed without comments the updated proposal for FT2016-2 with pre-operational status as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_6) to this paragraph.

In relation to the "pre-operational", there was a question on which table version should be applied. It was informed that when a pre-operational entry is adopted, the new entry is inserted in the operational tables, which formal table version is unchanged but the table version number in a BUFR message is incremented (operational number plus one) in accordance with the Note 5 to Section 1 in SPECIFICATIONS OF OCTET CONTENTS chapter of FM 94 BUFR.

The pre-operational tables (only sub-version incremented) will be made available from the WMO web the same as the case of introducing new version tables. In this case, the pre-operational version 27 is indicated in BUFR messages instead of 26 until November 2016. The table version 27 becomes operational in implementation of FT2016-2 but any changes to the pre-operational BUFR messages are unnecessary.

### 3.2.7 Additional bio-geochemical sequences for data from Argo profiling floats[⮉](#Cont_3)

Dr David Berry, JCOMM, proposed sequences for the reporting of additional bio-geochemical data from Argo profiling floats, which have previously been reviewed by the Argo Steering Team and Argo Data Management Teams. Dr Berry expected the validation will be done by the end of this year for adoption by FT2017-1.

It was noticed that the proposed four Table D entries are almost the same except for the observational data, such as 0 41 002 Chlorophyll-A in 3 06 044. There were some questions about the unit of backscattering and 0 07 062 to 0 33 050 to be coded as missing.

Dr Berry expressed that he and an expert from UKMO will be able to validate the proposal by the end of this year.

The meeting agreed the proposal for validation as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_7) to this paragraph.

### 3.2.9 Revised and additional new descriptors for radar data products[⮉](#Cont_3)

DWD has upgraded the radar composite routines to a new system. In this context, the BUFR format was updated, especially more meta information is to be given. Currently the descriptors in use are in the local table version 8 of the originating centre 247 and sub-centre 0. Such products are already exchanged within OPERA.

Ms Sibylle Krebber, DWD, proposed new entries to create the composite radar data to be used by originating centre 78, sub-centre 10, which was initially proposed for validation at the third meeting of IPET-DRMM (2015-3.2.8 DRMM-III) and was updated during the validation process for better understanding of the BUFR Radar products.

The meeting reviewed the updated proposal and agreed the proposal for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_9) to this paragraph, provided the validation will be finished. Ms Krebber noted the idea that a short replication could precede the descriptor 0 29 014 and accepted some minor adjustments to parameters of BUFR/CREX Table B entry.

### 3.2.10 Revised note for encoding geographic coordinates in BUFR and new element descriptors for encoding coordinate reference systems and fixed reference mean sea level[⮉](#Cont_3)

A main advantage of BUFR is the inclusion of coordinates with weather messages. However, coordinates can only be interpreted with surety, when the coordinate reference system is known.

Ms Sibylle Krebber, DWD, proposed the new descriptors in BUFR/CREX Table B for encoding coordinate reference systems and fixed mean sea level reference datum and a note to the representation form of BUFR for reducing ambiguity. The issue has been discussed at the previous meeting of IPET-DRMM where some changes were suggested.

Ms Krebber inform the meeting that the revised proposal has been duly validated.

The meeting thanked Ms Krebber and DWD for their initiative and agreed the proposal on the new note to the representation form for adoption between CBS sessions 2017 and the others for FT2016-2 as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_10) to this paragraph, provided validation will be completed for the newly proposed entries.

### 3.2.11 Development of a LIDAR & Ceilometer Table D Sequence[⮉](#Cont_3)

The BUFR template for radar wind profiler (2013-3.2.2 DRMM-I) was submitted by the UK Met Office (UKMO) and MétéoSuisse to the first meeting of IPET-DRMM in Tokyo, 2013.

Mr Richard Weedon, UKMO, presented a new template for Lidar and ceilometer developed in parallel with the above templates, which header sections are identical accordingly, together with several new descriptors in BUFR/CREX Table B to be required in the new template.

Several comments were provided on the proposed components of the template, such as 0 07 001, 0 10 071 and several quality descriptors. Mr Weedon agreed to review the proposal in accordance with the comments with their development team.

The meeting agreed the proposal for validation, noting that Mr Weedon estimated the proposal will be finalized and validated for adoption by FT2017-1, as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_11) to this paragraph.

### 3.2.12 Radiosounding meta-data reporting: clarifications and amendments required[⮉](#Cont_3)

Mr Alexander Kats, Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), presented two documents, which have been kindly rewritten to separate two issues in the initial document (Doc 3.2.12): a) amendments meeting the requirements from GCOS Reference Upper Air Network (GRUAN) community and b) the follow-up actions and work required for reporting metadata associated with upper-air radiosounding, in particular, from GRUAN sites.

In the former document (Doc 3.2.12a), Mr Kats requested four new descriptors in BUFR/CREX Table B and their associated code tables along with several entries in the existing code tables.

The meeting agreed that the proposal on new entries in the existing code tables and the text in the element description column of 3 01 128 for FT2016-2, while the new element descriptors and associated code tables for validation as in the [**Annex I**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_12_I) to this paragraph.

Mr Kats asked the meeting about the follow-up actions and work required for reporting metadata associated with upper-air radiosounding, in particular, from GRUAN sites (Doc 3.2.12b).

The meeting discussed the issue raised by Mr Kats, and reached a consensus as in the [**Annex II**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_12_II) to this paragraph.

### 3.2.13 Reporting of measurement uncertainties in BUFR[⮉](#Cont_3)

Mr Alexander Kats, Roshydromet, presented a document inspired by the request from GRUAN community.

GRUAN aims at providing long-term reference observations of upper-air essential climate variables. One of attributes of reference observations is to report measurement uncertainties along with each measurand. In respect to vertical upper-air profiles, it means uncertainty estimates should be vertically resolved.

Mr Kats invited the meeting to accept the need in unified approach for reporting of measurement uncertainties in BUFR, to consider proposed ways for its development and to make respective advices. He preferred a solution within the current edition 4.

Mr Kats explained in detail three points, which are use of significance qualifiers, associated fields and class 33 descriptors.

The meeting concentrated on the class 33 solution with bit map and at last Dr Simon Elliott, chair of IPET-DRMM, concluded that the meeting preferred the approach with 2 22 000, bit map and class 33. The meeting concurred on this summary.

Mr Kats mentioned further study will be necessary in cooperation with the team.

The meeting agreed the suggested the entry 1 in 0 08 092 and the first three entries in 0 08 093 for validation as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_2_13) to this paragraph, keeping in mind these are new code tables and may be modified.

# 3.3 BUFR and CREX new editions

### 3.3.1 Proposed feature selection for BUFR Edition 5[⮉](#Cont_3)

The third meeting of IPET-DRMM (IPET-DRMM-III) in Beijing discussed BUFR edition 5 and how to proceed with the list of requirements that has been gathered in recent years, including those recommended by the joint session with the Inter-Programme Expert Team on Metadata and Data Interoperability (IPET-MDI) (Exeter, UK, 2012).

A requirement referred to as scoping (see Doc. 3.3(1)), recommended by the joint session above, was reviewed, which was highly desirable but had an impact on not only many of the current Table D sequences but also possible combinations of descriptors allowable by the current data description syntax for BUFR.

In accordance with the impact and the short time left to propose BUFR edition 5 for the upcoming CBS, the IPET-DRMM-III decided to focus on feature requests that would provide improvements with lesser impacts.

Mr Yves Pelletier, MSC, who has lead the development of the new edition of BUFR, explained the proposed set of feature requests for the new edition of BUFR. Mr Pelletier emphasized these requirements were selected in accordance with an impact scale and ultimately judgment on cost/benefit and existence of sufficiently clear and compelling use case.

Mr Pelletier proposed to achieve the software implementation of BUFR edition 5 by means of relatively incremental changes to the existing source code of existing encoder/decoders for BUFR edition 4. Mr Pelletier invited the meeting that interested centres should devise a development plan, including the implementation, testing and validation of the proposed new features.

It was noted the eventual operational migration to BUFR edition 5 was envisioned as a gradual process, driven in part by the introduction of new data products. Accordingly, it was recommended that BUFR edition 4 remained in operational use for a significant amount of time in the future.

The consensus of the meeting is shown as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_3_3_1) to this paragraph for each requirement.

# 4. SUMMARY AND CONCLUSION OF PROPOSALS

### 4.1 Summary on amendments after IPET-DRMM-III[⮉](#Cont_4)

In accordance with the implementation of the *Procedure for Maintaining Manuals and Guides* (Res. 21 (Cg-17) valid as from 1 January 2016), the fast-track procedure (FT2016-1) and the procedure for adoption between CBS sessions (ABC2016) have been taken along with FT2015-2 by the previous *Procedures for Amending the Manual on Codes* during the intersessional period of IPET-DRMM without going through CBS and EC sessions as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_4_1) to this paragraph.

This agenda item is to place these amendments on record, which are not adopted by CBS sessions of and Executive Council anymore.

Proposals on amendments to GRIB2, BUFR and CREX, and the Common Code tables, which have been approved for validation, are listed on WMO web along with those waiting for implementation.

The meeting reviewed each proposal in the list one by one and updated the status of these proposals, which are also shown in the same [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_4_1).

### 4.2 Conclusion on past proposals (in lieu of PFC)[⮉](#Cont_4)

Two validation repots were submitted by Dr David Berry, JCOMM and Ms Sibylle Krebber, DWD with respect to:

(1) Validation report of GRIB2 new compression method – CCSDS libaec

(2) New BUFR elements and sequences for the reporting of Synoptic Reports from Sea Stations Suitable for VOS Data

These were referred in the item 2.2(6) and 3.2(6), respectively and no specific discussion was made in this agenda item.

# 5. REGULATIONS FOR REPORTING TRADITIONAL OBSERVATION DATA IN TABLE-DRIVEN CODE FORMS (TDCF): BUFR OR CREX

(No proposal)

# 6. TRADITIONAL ALPHANUMERIC CODES

### 6.1 Amendment 77 to ICAO Annex 3[⮉](#Cont_6)

Mr Neil Halsey, representative from International Civil Aviation Organization (ICAO), informed the WMO Secretariat and the IPET-DRMM that the ICAO had decided not to carry out the amendments that was submitted at IPET-DRMM-III in relation to the Amendment 77 of ICAO Annex 3/WMO Technical Regulations, Volume II (WMO-No. 49).

Mr Yves Pelletier, MSC, brought the decision by ICAO to the attention of the meeting, recognizing that no further work would be requested to IPET-DRMM in this context regardless of readiness of TT-AvCI.

It was notified that the next Amendment to ICAO Annex 3 was expected in 2018 due to the change to the cycle of amendments at ICAO side.

# 7. MIGRATION TO TABLE DRIVEN CODE FORMS (TDCF)

### 7.1 Status of migration by WWW Monitoring Exercise[⮉](#Cont_7)

The meeting was informed of the results of the Special MTN Monitoring (SMM) on reports exchanged in BUFR during 1-15 January 2016, which are as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_1) to this paragraph and summarized below, since the statistics for April 2016 appeared to be problems with the gathering of the monitoring statistics from the participating RTHs.

Surface BUFR reports: In Regions II and VI the distribution of surface in TDCF is similar (though often lower than) for TAC. For many observing sites it is clear that the Member is capable of producing reports in TDCF but did not always do so (though it should be borne in mind that this is exactly the pattern that would be seen if TDCF were introduced during the month).

In Regions III and V, many Members have been good progress in creating TDCF reports, but there are still some that have not yet started distributing reports.

Progress with migration in Region I is hindered by the overall lack of observations. ASECNA has assisted its Member countries by converting observations to TDCF.

Upper-air BUFR reports: All regions have made some progress to reporting upper air reports in TDCF. Some countries (most visible in the plot because of their size are Canada and Russia) had started issuing reports in TDCF for some stations but had not completed the migration.

These statistics only reflect whether an upper air report was received from the country; it does not indicate whether it was a “native” report or converted from a TAC report.

Climate BUFR reports: Although many countries produced CLIMAT reports in TDCF, many did not. There was no clear Regional pattern for the migration, suggesting that the Regional Associations may have concentrated on those reports used for operational weather forecasting.

In this relation, the meeting glanced at the issue of upper-air BUFR data being dealt by the CBS Management Group Task Team. It was informed high resolution upper-air data from source are the request from NWP centres.

There were some demands on monitoring to meet emerging requirements, such as a monitoring that does not count BUFR reports with violation to B/C Regulations and that could exclude converted BUFR reports.

An experience to correct erroneous BUFR reports in a specific country was reported briefly, which cannot be reflected in the WWW Monitoring.

It was pointed out that SMM in April 2016 would have some problems, in which numbers of reports received are incorrectly counted.

# 7.2 Reports by members on status of migration

### 7.2.1 Status of migration in RA I[⮉](#Cont_7)

Mr Samuel Machua, Kenya Meteorological Department (KMD), reported the status of migration to TDCF in RA I, which summary is as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_1) to this paragraph along with his proposals to facilitate the migration in the region.

Mr Machua emphasized, despite the challenges experienced by many NMHSs in RA I, some progress in TDCF migration was observed in the last 12 months. The major challenges are lack of encoding software and connectivity to RTH that can manage transmission of BUFR reports. There are also a few countries that are yet to receive any TDCF training.

According to the survey carried out at RTH Nairobi in April to May 2016, SYNOP reports in BUFR were transmitted by 13 out of 53 countries (25%), while TEMP reports in BUFR were by 3 countries (6%). CLIMAT reports are mainly being transmitted in TAC.

Mr Machua added parallel transmission of BUFR and TAC was continuing in those NMHSs that have migrated to TDCF. Encoding of the messages to TDCF is the biggest challenge. For the forecasting purposes, most of the NMHSs in RA I visualizes the reports from GTS through systems, such as Messir, Synergy, Puma etc., hence requirement for TDCF decoders is not as critical as that of encoders.

Regarding the question on requirements for CREX, it was noted that use of CREX would not be considered for data exchange in Region I.

The lesson from the training event by ASECNA is that, for the training to be useful, it has to be integrated in a plan for the migration and give rise to an immediate application.

The meeting thanked Mr Machua for his initiative toward the migration complete in Region I.

### 7.2.2 Status of migration in RA II[⮉](#Cont_7)

Ms Jitsuko Hasegawa, Japan Meteorological Agency (JMA), presented the migration status in RA II and activities by RA II members related to the migration to TDCF as the Theme Leader in Data Representation and Metadata in RA II. It is detailed in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_2) to this paragraph and its summary is below.

SYNOP, TEMP and PILOT reports from April 1 to 15, 2016:

RTH Tokyo received (i) at least one surface synoptic observation report in BUFR from 77% of RBSN in RA II (TAC format from 94%), and (ii) at least one upper-air sounding report in BUFR from 55% (TAC format from 91%). Eighteen BUFR reports equivalent to PILOT reports were received, while TAC bulletins were received from 16 stations.

CLIMAT reports:

As of May 2016, ten Members were reporting CLIMAT data in BUFR: China; India; Mongolia; Saudi Arabia; Pakistan; Japan; Bangladesh; Hong Kong, China; Macao, China and Thailand.

Marine reports:

As of May 2016, India (TESAC), Hong Kong, China (SHIP), Japan (TESAC, TRACKOB, SHIP) and Republic of Korea (TESAC) were routinely disseminating marine observation data in BUFR.

In addition, Ms Hasegawa reported that a questionnaire was sent to all focal points (34 Members) in November 2015 and received responses from 18 Members (53%) with in the same month (see Doc. 7.2(2) in detail).

The survey showed two-thirds of respondents recognized the format/quality issue of upper-air BUFR reports and three respondents are already producing and nine have plans for production of native BUFR reports.

The issue of native BUFR was discussed in this regard. It was a view of NWP centres that there was no benefit of BUFR even if a converted upper-air BUFR report contains full observations from the corresponding TEMP Parts. There were several views on the issue of conversion of TEMP to BUFR.

At the end of the discussion, with respect to BUFR reporting, it was invited HMEI representative to make an announcement from a web page on support to modern and legacy sounding ground equipment or make a consolidated list for options available for existing upper-air sounding equipment.

The meeting thanked Ms Hasegawa for her continuous efforts and initiative on the migration issues as the Theme Leader in Region II.

### 7.2.3 Status of migration in RA III[⮉](#Cont_7)

Mr Jose Mauro de Rezende, Instituto Nacional de Meteorologia (INMET), reported the status of migration in RA III, the information of which is provided by experts and focal points in RA III.

Region III continues working on the replacement of the Traditional Alphanumeric Codes into the Table Driven Code Format in order to complete the WMO migration program. The status in each country is as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_3) to this paragraph.

It was noted that though the status of migration differs by country, GISC Brasilia and DCPC Buenos Aires have been assisting centres within their area of responsibility, converting between BUFR and TAC.

Mr de Rezende notified that a training seminar, held in Montevideo for Spanish speaking countries in Region III and IV, provided enough knowledge and information to the participants. It was of great help for many countries within the region to develop their migration strategy plans.

It was noticed, in relation to the Chili's case, importance of the procedure to stop distribution of TAC, which has been established years ago.

The meeting thanked Mr de Rezende for the leading role of GISC Brasilia in Region III for the migration.

### 7.2.4 Status of migration in RA IV[⮉](#Cont_7)

Mr Yves Pelletier, MSC, presented the status of migration to TDCF in Region IV with reference to the information provided by Mr Glendell De Sousa of the Caribbean Meteorological Organization, who is a co-chair of RA-IV Task Team on WIGOS/WIS.

The table in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_4) shows incremental progress in the migration to TDCF since a similar poll was performed in 2015.

Mr Jeffrey Ator, NOAA/NWS, informed that USA is in the middle of a project to generate high resolution radiosonde BUFR reports directly from the observation sites and send them to GTS. The transition should be complete by next year.

The meeting thanked Mr Pelletier and Mr Glendell De Sousa for their initiative on migration to TDCF in Region IV.

### 7.2.5 Status of migration in RA V[⮉](#Cont_7)

Dr Weiqing Qu, Bureau of Meteorology (BoM), informed the meeting of the status of migration in Region V verbally.

Dr Qu mentioned a training took place in 2014 and 2015. Conversion is done in Australia and New Zealand. New development in Australia is high resolution upper-air data in BUFR to stop sending converted BUFR.

The meeting thanked Dr Qu for his information on the migration status.

### 7.2.6 Status of migration in RA VI[⮉](#Cont_7)

Mr Alexander Kats, Roshydromet, presented the result of survey on migration in Region VI conducted in May 2016, referring to the excel sheet, which is partially reproduced in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_6) to this paragraph.

The survey was conducted at WMC/RTH Moscow from 1 to 23 May 2016, analysing and summarizing abbreviated headings, amount of bulletins from RA VI members, observation time and some details of sections 1 and 3 contents, allowing to identify type of observations and template in use.

In Region VI, 21 Members are fully migrated, while six have not started migration. Mr Kats felt it would be needed to address the issue directly to PRs of Members concerned.

The meeting thanked Mr Kats for his contribution to the migration achieved and future in Region VI.

### 7.2.7 Status of migration in JCOMM[⮉](#Cont_7)

Historically, a number of Traditional Alphanumeric Codes (TAC) have been used by the marine community to report oceanographic and marine meteorological data on the Global Telecommunications System (GTS).

Dr David Berry, JCOMM, presented the status of migration in JCOMM. As of May 2014, each of TAC has a BUFR representation as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_7_2_7) to this paragraph. Dr Berry stated the migration to Table Driven Code Forms (TDCF) can be considered complete from a data representation perspective. It remains for the operational centres reporting and retrieving marine data from the GTS to implement the BUFR templates.

Dr Berry presented maps showing the number of observations reported in TAC and TCDF, which are available from the JCOMMOPS website: <http://www.jcommops.org/ftp/SOT/MAPS/>

A similar map for data buoys (moored and drifting) has been generated by E-SURFMAR for the 16 May 2016 and is available from the ECMWF wiki site:

<https://software.ecmwf.int/wiki/display/TCBUF/Drifting+buoys>

The meeting thanked Dr Berry for his leading role in the migration within JCOMM community and contribution to the meeting with comprehensive information.

# 7.3 TAC2BUFR Check at DWD[⮉](#Cont_7)

Ms Sibylle Krebber, DWD, presented a web-based tool developed by DWD in view of the cases that messages with encoding errors are put into circulation, make a negative effects on operational numerical weather prediction and lower the quality of climate-scale time series data.

During the transition period of migration to TDCF, messages are disseminated as FM12 and FM94 in parallel, which gives an opportunity to compare individual observations encoded in different formats and to find and remove encoding errors.

Daily results of the web-based tool are available online and are currently password protected in order to respect the privacy of other centers. It can be found at the following URI:

<http://www.deutscher-wetterdienst.de/TAC2BUFR/SV/webt2b_main.html>

Ms Krebber highlighted the web view showed only a deviance found between both code forms, which is not always signify an error. The tool compensates such non-error deviations as many as possible, but the deviances still need to be investigated on a case-by-case basis.

Ms Krebber expressed that information on acceptable error from unit conversion for example could be made available on the web page.

A concern was expressed that some countries may have a problem, if the web-based tool is open to public and the information would not reflect well quality of the data.

While the concern was expressed, the meeting recognized the web-based tool would help migration. The meeting finally endorsed to make a web-based tool available without access restriction.

# 8. MANUAL ON CODES

### 8.1 Amendments to the Procedures for amending the Manuals on Codes and the GTS[⮉](#Cont_8)

The *Procedures for Maintaining Manuals and Guides Managed by the Commission for Basic Systems* (Res. 21 (Cg-17) has come into force on 1 January 2016.

It was notified that the sixty-eight session of WMO Executive Council (EC) would adopt amendments to the *Procedures* above in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_8_1) to this paragraph, by which the President of WMO will be involved in the process for adoption on behalf of Executive Council (EC) in conformance with the General Regulation 9 (5).

The meeting focus on the meaning of "tables and templates" in the Annex 4 to the draft Resolution 19.2(2)/1 (EC-68), in particular, applicability of Table C and templates in B/C Regulations.

It was explained that the "tables" and "templates" mean all tables, including Table C, and GRIB templates, respectively. The meaning of "tables" is, however, maximum and is practically restricted as the fast-track procedure is not applicable to amendments that have an impact to software, which requires longer time.

Regarding "templates", it does not contain entries in both Table D and B/C Regulations, because if a template in Table D is changed, there will be contradiction between it and the B/C Regulations, which is not in scope of the fast-track.

The meeting agreed that more time would be required for adoption by the fast-track procedure after the procedure amended, which shall be taken into account when the fast-track procedure is taken.

# 9. WMO STANDARD DATA DESIGNATORS

### 9.1 Data designators for aviation information in XML[⮉](#Cont_9)

Amendment 78 to ICAO Annex 3/WMO Technical Regulations, Volume II (WMO-No. 49) will introduce a requirement to exchange additional information in XML form, such as the equivalent of AIRMET, Volcanic Ash Advisory and Tropical Cyclone Advisory messages, in support of international civil aviation.

It was notified, in relation to the above, that CBS IPET-MDRD (TT-AvXML) is developing the XML representations for these types of information and will propose standards to the 16th session of CBS in parallel.

The meeting reviewed the draft amendments, which are in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_9_1) to this paragraph, to the Att. II‑5 of Manual on the Global Telecommunication System (WMO‑No.386), including the priority on the GTS.

The meeting agreed the amendments and that the fast-track procedure should be taken, provided that the proposed amendment specified in the item 8.1 above is adopted by EC-68.

The changes will be notified through the Operational News Letter from web site. The WIS focal points will be consulted on this proposal for adoption by the fast-track procedure.

# 10. IPET-DRMM AND TASK TEAMS

### 10.1 Terms of References of IPET-DRMM and Task Teams[⮉](#Cont_10)

The 16th meeting of CBS Management Group (MG) took place from 15 to 19 February 2016 in Geneva. It discussed the structure of CBS after the 16th session of CBS (CBS-16) together with other CBS issues and decided the proposal to be submitted to CBS-16 on the structure of OPAG ISS as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_10_1) to this paragraph, where IPET-DRMM retains as IPET but the name is slightly shortened to IPET-CM (Codes Maintenance).

It was informed that the draft ToR of IPET-CM will be finalized at the next meeting of ICT-ISS in Geneva from 29 June to 1 July 2016.

The meeting noted that new tasks of IPET-DRMM acquired during the past four years, which are GTS headings and Plotting models, are not in the tasks of IPET-CM and invited ICT-ISS to clarify the points.

The meeting also noted ambiguity of the preamble of the note below the team name with respect to "work by correspondence". It invited its rephrasing, too.

# 11. COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES

### 11.1 Endorsement OGC document number 16-060: A GRIB2 Coverage Encoding Profile[⮉](#Cont_11)

Ms Sibylle Krebber, DWD, presented the document on the proposed Open Geospatial Consortium (OGC) standard to support encoding web coverages in GRIB2.

The Web Coverage Service (WCS) is a standard maintained by OGC, which is becoming popular for the dynamic discovery and exchange of raw geospatial data. NetCDF is supported by this standard and widely used. As the use of web services in the atmospheric and oceanographical domain is increasing, many users desire the possibility to exchange data in GRIB rather than convert to other formats. Ms Krebber emphasized that this was the reason that a proposal had been suggested within the Meteorology and Oceanography Domain Working Group of OGC to allow the exchange of GRIB2 data in WCS.

The proposal above can be summarized in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_11_1) to this paragraph, which has been endorsed by the Domain Working Group and has now been submitted to the Technical Committee for approval. If the proposal is endorsed by the meeting, it would show that WMO supports the exchange of meteorological data in modern, RESTful web frameworks.

Ms Krebber stated the proposal was considered non-controversial for WMO, as it only exposes GRIB2 data for discovery as a WCS layer and does not affect the semantics of GRIB2.

It was hoped that the approval by the meeting would ease the approval by the Technical Committee.

The meeting reviewed the implication of the request, "endorse", carefully and decided to endorse the proposal, recognizing the word is not harmful.

### 11.2 Issues resulting from the fourth meeting of IPET-MDRD[⮉](#Cont_11)

The meeting of Inter-Programme Expert Team on Metadata and Data Representation Development (IPET-MDRD) took place from 9-12 May 2016 in Geneva, Switzerland.

Code lists, which means entries in TDCF tables, are key to the operation of the TDCF, and also underpin WIS metadata and XML data representations. IPET-MDRD proposed the set of principles for managing code lists as in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_11_2) to this paragraph. Their intention was to allow users of code list terms to be able to identify when terms used in different code lists and to avoid creation of new code lists where existing ones would suffice.

IPET-MDRD preferred to use the principles in the [**Annex**](file:///\\internal.wmo.int\userdata\redirected\AShimazaki\WORKPLACE\MEETING\IPET-DRMM\IPET-DRMMIv_Geneva2016\Report\Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_11_2) and sought the agreement of IPET-DRMM that they would be helpful to both groups.

IPET-MDRD also wished to inform IPET-DRMM that TT-WMD (WIGOS Metadata) had produced a list that was intended to include names for all observed physical parameters of relevance to WMO, and that such a list might provide a useful reference point for terms that were used in other lists.

There was a long discussion to fill the gap on understanding of terms used by the two expert teams. Finally, the meeting agreed with most of the principles reproduced in the [**Annex**](file:///\\internal.wmo.int\userdata\redirected\AShimazaki\WORKPLACE\MEETING\IPET-DRMM\IPET-DRMMIv_Geneva2016\Report\Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_11_2) to this paragraph, and noted that IPET-DRMM has already followed most of them themselves when defining new entries.

With regard to the principle 5, though the team agreed that describing the relationships between items was useful (for example as  expressed in the BUFR classes), the team noted that it did not have the expertise to comment on the suitability of the SKOS framework for describing relationships between terms.

### 11.3 CBS MG Task Team on representing upper air information in BUFR – Report to IPET-DRMM (May 2016)[⮉](#Cont_11)

CBS Management Group Task Team on representing upper air information in BUFR has held its kick-off webex meeting on 21 April 2016. Mr Stefan Klink (EUMETNET) lead the discussion as the Lead of TT.

The Task Team discussed the Terms of Reference, the expected deliverables and corresponding deadlines. It established sub-groups to deal with each issue. The sub-groups have started working by email on task a2 and d. The latest status of TT's activity is shown in the [**Annex**](Report_IPET-DRMM-IV_Geneva_annex.docx#A2016_11_3) to this paragraph.

Mr Yves Pelletier, MSC, offered to contribute to the drafting of document by the TT, which will summarize the benefits of using TDCF in preference to TAC from the perspective of NWP centres.

# 12. CLOSURE OF THE MEETING

The meeting was closed at 16:35 on Friday 3 June 2016.

* **ANNEX TO PARAGRAPH 1.2**[**⮉**](#S2016_1_2)

**PROVISIONAL AGENDA**

|  |  |
| --- | --- |
| **1** | **ORGANIZATION OF THE MEETING** |
| 1.1 | Opening of the meeting |
| 1.2 | Approval of the agenda |
| 1.3 | Working arrangement |
| **2** | **GRIB** |
| 2.1 | Amendments to GRIB regulations |
| 2.2 | Additions to and modifications of templates and tables |
| 2.3 | GRIB new edition |
| **3** | **BUFR AND CREX** |
| 3.1 | Amendments to BUFR/CREX regulations |
| 3.2 | Additions to and modifications of tables |
| 3.3 | BUFR and CREX new editions |
| **4** | **SUMMARY AND CONCLUSION OF PROPOSALS** |
| 4.1 | Summary on amendments after IPET-DRMM-III |
| 4.2 | Conclusion on past proposals (in lieu of PFC) |
| **5** | **REGULATIONS FOR REPORTING TRADITIONAL OBSERVATION DATA IN TABLE-DRIVEN CODE FORMS (TDCF): BUFR OR CREX** |
| **6** | **TRADITIONAL ALPHANUMERIC CODES** |
| 6.1 | Amendments that result from Amendment 77 to ICAO Annex 3 |
| **7** | **MIGRATION TO TABLE DRIVEN CODE FORMS (TDCF)** |
| 7.1 | Status of migration by WWW Monitoring Exercise |
| 7.2 | Reports by members on status of migration |
| 7.3 | TAC2BUFR Check at DWD |
| **8** | **MANUAL ON CODES** |
| 8.1 | Review of the Procedures for maintaining Manuals and Guides managed by CBS |
| **9** | **WMO STANDARD DATA DESIGNATORS** |
| 9.1 | Amendments to the Manual on the GTS on abbreviated headings |
| **10** | **IPET-DRMM AND TASK TEAMS** |
| 10.1 | Terms of References of IPET-DRMM and Task Teams |
| **11** | **COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES** |
| 11.1 | Endorsement OGC document number 16-060: A GRIB2 Coverage Encoding Profile |
| 11.2 | Issues resulting from the fourth meeting of IPET-MDRD |
| 11.3 | CBS MG Task Team on representing upper air information in BUFR – Report to IPET-DRMM (May 2016) |
| **12** | **CLOSURE OF THE MEETING** |

**FOURTH MEETING OF THE INTER-PROGRAMME EXPERT TEAM**

**ON DATA REPRESENTATION MAINTENANCE AND MONITORING (IPET-DRMM)**

(GENEVA, SWITZERLAND, 30 MAY - 3 JUNE 2016)

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