**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR BASIC SYSTEMS**

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

**ON DATA REPRESENTATION MAINTENANCE AND MONITORING**

**FINAL REPORT**

**BEIJING, CHINA, 20 - 24 JULY 2015**

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**Executive Summary**

The third meeting of the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) took place in the Meteorological Science and Technology Building at the China Meteorological Administration (CMA) in Beijing, China from 20 to 24 July 2015.

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) and agreed that nineteen proposals have been duly validated (or non-controversial) and should be forwarded to the formality stage (fast-track procedure), which are in summary amendments to:

- GRIB2 for mountain wave turbulence, fire modelling, climate study, cloud related parameters, commonly exchanged post-processing products, hydrological modelling, templates for spatio-temporal changing tiles and ground surface conditions,

- BUFR/CREX for dropsonde, new satellite observations (NEdT), surface qualifier for AWS, radio occultation, high resolution radiosonde observations, SHIP or marine platform wind data, Argo profiling float and dual polarization radar, and

- Common Code tables for a sub-centre of Italy, a new satellite, JASON 3, and new sub-categories (radiation and acid rain).

In addition, the meeting confirmed that some proposals will be validated urgently by centres concerned and to be forwarded to the fast-track 2015, which are for quantitative satellite products by Australia (GRIB2), GPM Microwave Imager (BUFR) and additional synoptic observations (BUFR).

The meeting reviewed carefully amendments to Regulations of FM 92 GRIB and B/C Regulations of FM 94 BUFR, which are:

- GRIB2 for georeferencing grid points and negative forecast time,

- BUFR/CREX for regional reporting practices on monthly precipitation, comprehensive set of radiosonde metadata and wind reporting at Poles.

The meeting agreed these amendments to be forwarded to the procedure for adoption between CBS sessions along with the minor amendment to aviation weather reporting (METAR, SPECI) based on the Amendment 77 to ICAO Annex 3.

With regard to the new editions of GRIB and BUFR/CREX, the meeting came to the conclusion that the team would push forward with the next editions of GRIB (edition 3), BUFR (edition 5) and CREX (edition 3, if needed).  Specifications for these next editions will be worked out by the TTs concerned during the coming year and are due to be presented for final approval during the 2016 meeting of the IPET-DRMM, selecting only those amendments that are of the utmost importance to the meteorological community but also expected to be minimally impactive to those who don’t require the use of the new features.

The Cg-XVII adopted the new *Procedures for Maintaining Manuals and Guides Managed by the Commission for Basic Systems* (Rec.15 (CBS-Ext.(2014))), which is based on the current *Procedures for Amending the Manual on Codes* but generalized as required to be applicable to other CBS related manuals and guides. The meeting confirmed that amendments to the Manual on Codes could be processed in the same way as under the current Procedures with some exceptions, such as consultation with other technical commissions.

The meeting discussed feasibility of separation of GRIB edition 1 from the Manual on Codes and B/C Regulations in multiple languages the same as the main parts of the Manual on Codes. It agreed unanimously the separation and multilingual B/C Regulations. The meeting also agreed in principle to move the plotting symbols in the Manual on the GDPFS to the Manual on Codes.

During the meeting, four Task Teams under IPET-DRMM had for the first time the face-to-face (sub-) meeting to facilitate exchange of views and decision making, which in fact contributed to finalizing relevant proposals at the meeting and outlining the future work plan of TTs.

With respect to the migration to TDCF, the meeting noted the Special MTN Monitoring in April 2015 showed non-negligible delay of migration in some regions, depending on data types, and concurred on the need for the three actions, such as creating a check list based on what are summarized in the status report on migration to TDCF by IPET-DRMM.

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

**ON DATA REPRESENTATION MAINTENANCE AND MONTORING**

**(BEIJING, CHINA, 20 - 24 JULY 2015)**

# 1. ORGANIZATION OF THE MEETING

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

The third meeting of the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) took place in the Meteorological Science and Technology Building at the China Meteorological Administration (CMA) in Beijing, China from 20 to 24 July 2015.

Mr Licheng Zhao, the Director of National Meteorological Information Centre (NMIC), gave a welcome speech to the participants on behalf of [Dr Zheng Guoguang](https://pub5.wmo.int/crm-prod/?q=individual-profile/6106), Administrator of CMA. Mr Zhao expressed code forms are most basic and important technique applications. TDCF has been introduced in 80s and improved data exchange efficiently and effectively. He emphasized the migration to TDCF has been made great progress recent years but much challenge should be made. This team is very crucial to the migration to TDCF.

Dr Steve Foreman, Chief of the DRMM division, WIS Branch, OBS Department of WMO, welcomed the participants of the meeting on behalf of the Secretary-General of WMO. Dr Foreman emphasized this is an important key meeting, which in addition to the normal aspects, maintaining of TDCF, is requested decisions on how to help migration to work.

Dr Simon Elliott, chair of the IPET-DRMM, encouraged participants not to be deep into every last detail in view of many different types of expertise in the team. Dr Elliott also encouraged that the team can focus on issues which need cooperative face to face work.

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

The meeting agreed on the agenda, which is shown in the [Annex](#A2015_1_2) to this paragraph along with the list of participants.

# 1.3 Working arrangement[⮉](#Cont_1)

The draft working plan was presented to the participants, including possible teleconferences with representatives of other organization and technical commissions.

The meeting agreed with the working plan, reflecting latest changes on teleconference scheduled.

# 2. GRIB

# 2.1 Amendments to GRIB regulations

### 2.1.1 Complete encoding of information required for georeferencing grid pointsin GRIB[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_1_1)

Several entries in GRIB Code table 3.2 (Manual on Codes, Volume I.2 (WMO-No.306)) specify the shape of the Earth without sufficient information to interpret coordinates, signifying positions on the earth's surface. This allows GRIBs to be encoded with latitude/longitude coordinates which may or may not be understood as the encoding user intended, because the reference prime meridian is left to the user's interpretation.

Ms Sibylle Krebber, Deutcher Wetter Dienst (DWD) presented her proposal, highlighting the issue of ambiguity in a coordinate system used in GRIB messages.

Historically, easting coordinates based on differing easting origins have led to confusion in many circumstances. Although the latitudinal origin is easily defined based on the earth's rotational characteristics, the longitudinal origin is a matter of arbitrary definition, creating the need for the definition and maintenance by an external authority, which are referred in the Code figures 2, 4, 5, 8 and 9 in the Code table 3.2, but the other code figures remain ambiguous.

The meeting reviewed the current Code table 3.2 and agreed that the new note proposed by Ms Krebber will facilitate WMO Members to understand the ambiguity of some coordinate systems in the GRIB Code table 3.2, which is to be approved by the procedure for adoption between CBS sessions as shown in the Annex to this paragraph.

Dr Enrico Fucile, European Centre for Medium-Range Weather Forecasts (ECMWF), offered their assistance to the validation.

# 2.1.2 New GRIB2 Regulations and notes to make it clear that forecast times may be negative[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_1_2)

There are a number of cases where it is desirable to allow the “forecast time” to be negative. These include, but are not limited to, accumulations which start before the reference time during a 4-D variational analysis, which was raised by DWD as agenda item 2.1.2 at IPET-DRMM-II in 2014.

Dr Weiqing Qu, Australian Bureau of Meteorology (BoM), emphasized the risk that some GRIB edition 2 software assumes the forecast time must be positive regardless of the fact that the regulations do not specify it must be positive. In particular, both wgrib2 and GRIB-API assume that the forecast time is positive and behave incorrectly when a negative value is encoded or decoded.

The meeting recognized the issue critical and reviewed the proposal by BoM. Accordingly, it agreed the new Regulation 92.6.3 to be introduced in GRIB edition 2. A change of wgrib2 and GRIB-API software will be coordinated by the respective responsible developers to conform with the added regulation.

On the other hand, the amendments to each product definition template were not preferred, because regulation is applied to each template and the confirmation will be needed when a new template is developed.

The meeting agreed the proposal as shown in the Annex to this paragraph to validate the impact of the new regulation and take the procedure for adoption between CBS sessions, because the risk of comparatively low.

# 2.2 Additions to and modifications of templates and tables

### 2.2.1 New parameters in GRIB2 Code Table 4.2[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_1)

### 2.2.2 New GRIB2 parameters and product definition template for observational satellite data

European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) has introduced quality control information values to its atmospheric divergence and multi-sensor precipitation estimate products. These data are being disseminated via the EUMETCast DVB multicast service, but are currently using inappropriate entries in Code table 4.2, Product discipline 3 (space products), parameter category 1 (quantitative products).

Dr Simon Elliott, EUMETSAT, proposed the new entries in the Code table 4.2.

NOAA/NWS/NCEP Ocean Prediction Center (OPC) plans to begin producing GRIB2 fields of observational data from the AMSR-2 satellite. Since this is data from a satellite, parameters will be reported from within discipline 3 (Space products).

Several intended products, including those for wind speed and rain rate, already have parameters defined within this discipline (parameter category 1), however, others do not have entries in the discipline. The OPC intends to report quality information for most of these parameters. As discussed initially at IPET-DRMM-I (Tokyo, July 2013), there is no general, extensible way to report quality information associated with a grid of data values in GRIB2. Though an approach was developed during the Tokyo meeting, it was never subsequently validated and so is still not part of the official GRIB2 regulations.

Mr Jeffrey Ator, NOAA/National Weather Services (NOAA/NWS), proposed additional parameters along with a new template for the new parameter. Mr Ator emphasized that during the development it was recognized that adjustment to the existing product definition template (PDT) 4.31 was needed. There were two variations of the new template. One exactly meets the requirement from NOAA/NWS and the other is to be expanded to cover more parameters in the Code table 4.10.

As a result of review by Dr Elliott, Mr Ator and some members of TT-GRIB, a flexible approach was developed to enable the reporting of quality information for any existing parameter in GRIB2 Code table 4.2. The approach is shown in the Annex to this paragraph. ECMWF, EUMETSAT and NOAA/NWS/NCEP will validate the contents of the Annex during the September/October 2015 timeframe. NCEP will then submit a validation report for final approval during the December 2015 end-of-year “period of review” for implementation in May 2016 (FT2016-1).

### 2.2.3 New GRIB2 parameter for aviation[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_3)

NOAA/NWS/NCEP Aviation Weather Center (AWC) will begin developing some new aviation forecast products in collaboration with several other NOAA line offices. Mr Jeffrey Ator, NOAA/NWS, proposed a new entry for reporting “Mountain wave”, which is a turbulence-like disturbance on the lee (downwind) side of a mountain caused by the interference of the high ground with the horizontal air flow.

The meeting agreed to forward the proposal to FT2015-2 as shown in the Annex to this paragraph with a slight name change.

### 2.2.4 New parameters for fire modelling[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_4)

As part of collaboration between ECMWF and the Joint Research Centre (JRC) of the European Commission established since 2011, ECMWF is producing probabilistic forecasts of fire danger indices up to 10 days lead time. The modelling component is based on the Canadian forest service fire weather index (FWI) rating system and produces daily simulations. The service has been developed in the framework of the Copernicus Emergency Services to monitor and forecast fire danger in Europe.

Dr Enrico Fucile, ECMWF, proposed new entries in the Code table 4.2 for the FWI and six components, which compose the rating system; Fine Fuel Moisture Code, Duff Moisture Code, Drought Code, Initial Fire Spread Index, Fire Build Up Index and Fire Daily Severity Rating.

The meeting noted the significance of these entries in supporting the initiative to monitor and forecast fire danger in Europe and agreed to forward to FT2015-2 as shown in the Annex to this paragraph.

### 2.2.5 New GRIB parameters for climate studies[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_5)

ECMWF has started a new reanalysis project (ERA5) with the aim of improving the climate report produced with previous projects by re-processing satellite records, increasing the number of observations and improving the assimilation methods.

As part of the ERA5 project a review of the parameters of interest for climate studies has been finalised. The focus of the chosen parameters has been on providing physical quantities which can be of wide use by the reanalysis community.

Dr Enrico Fucile, ECMWF, proposed new entries in Code table 4.2 for fluxes, rates or tendencies, which are connected to the parameterization of models and to be used in combination of average time statistics to obtain mean rate parameters for climate study.

The meeting reviewed the proposed entries and agreed to forward to FT2015-2 as shown in the Annex to this paragraph.

### 2.2.6 New entry in the Common Code table C-12 by Italy[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_6)

The National Research Council/Institute of Atmospheric Sciences and Climate of Italy (CNR-ISAC: Consiglio Nazionale delle Ricerche/L'Istituto di Scienze dell'Atmosfera e del Clima) is involved in the WMO WWRP/THORPEX/WCRP joint research project, Subseasonal to Seasonal (S2S) Prediction Project.

The focal point for codes and data presentation matters of Italy, Capt. Alessandro Cheloni has requested a new entry in the Common Code table C-12 to identify CNR-ISAC in GRIB messages.

The start of operational data transfer is expected in September 2015 to ECMWF. In consideration of this and the fact that the next fast-track implementation is temporary scheduled for November 2015, the pre-operational option of the new entry should be considered.

The meeting agreed unanimously to forward the amendment to FT2015-2 with pre-operational option as shown in the Annex to this paragraph.

### 2.2.7 New parameters in GRIB2 Code Table 4.1 4.2 and 4.3 for satellite data andproducts[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_7)

The BoM operationally generates many quantitative satellite products that are used in forecasting operations. Many of these products do not have corresponding GRIB table entries but local table entries regardless of the fact that some of the fields are intended to be exchanged internationally.

Dr Weiqing Qu, BoM, proposed these entries to promote international exchange of the products. Dr Qu hoped the proposed entries would provide some examples and guidance for data producers to follow.

The meeting highly appreciated the positive approach that will further facilitate the international exchange of satellite data. The chair, Dr Simon Elliott thanked Dr Qu and in particular the contribution from Mr Charles Sanders who was a member of the previous entity of this team and still active on coding issue.

The meeting felt necessity of final adjustments to the reference numbers of proposed entries and agreed to forward to the validation stage with FT2015-2 option as shown in the Annex to this paragraph.

### 2.2.8 New parameters in GRIB2 Code Table 4.2 and encoding of some cloud base fields in GRIB2[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_8)

Dr Weiqing Qu, BoM, proposed some new entries in Code table 4.2, parameter category 0, 4 and 6.

In relation to his proposal, Dr Qu requested the meeting to clarify the meaning of some entries in category 6, Code table 4.2, which are not completely clear whether they are area fractions, volume fractions, or some others. He understood they are area fractions, then they should be "Area fraction of ..." or "Horizontal fraction of ..." with unit of m2 m-2.

In addition, Dr Qu asked a solution for the difficulty in GRIB to represent the vertically integrated cloud cover, which is the accumulated coverage between the surface and a specified level after accounting for cloud layers overlapping.

The meeting requested Dr Qu to consider dropping unnecessary entries and change units of 0-6-47 to 49 to Numeric in his proposal, which were accepted by him.

The proposal is forwarded to FT2015-2 except for the amendment to Code table 4.5, which is to be forwarded to the validation stage as shown in the Annex to this paragraph.

Regarding the unit of horizontal or area fraction, the meeting reached a consensus that the unit is Numeric.

There was active exchange of views on vertical integrated cloud cover issue. The meeting was of the opinion that the option A, which Dr Qu illustrated in his document, would be acceptable.

### 2.2.9 New GRIB2 Parameters in Code Table 4.2[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_9)

Post-processing tools, such as “fieldextra” used by the COSMO consortium, are used to produce meteorological products covering a wide range of categories.

Ms Sibylle Krebber, DWD, proposed new entries in Code table 4.2, product discipline 0 (meteorological products), parameter category 0 / 2 / 7 for encoding of commonly exchanged post-processing products as attached to this paragraph, noting that it may be justified to make entries in Code table 4.2, product discipline 0 – meteorological products, parameter category 19 (physical atmospheric properties) where the “Richardson number” is already defined (parameter number 12).

The meeting reviewed her proposal and requested slight modification to the parameter name of wind direction, which have clear definition. The proposal was agreed to forward to FT2015-2 as shown in the Annex to this paragraph.

# 2.2.10 New parameters for hydrological modelling[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_10)

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. EFAS helps to protect European citizens, the environment, property and cultural heritage when major floods occur.

In this framework, 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, explained the background of his proposal. The new entries proposed are going to be exchanged in GRIB2.

The meeting recognized the requirements for the new entries and agreed to forward the proposal to FT-2015-2 as shown in the Annex to this paragraph.

# 2.2.11 Validated GRIB templates for spatio-temporal changing tiles and proposal for explanatory notes[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_2_11)

The proposal on templates for spatio-temporal changing tiles (2014-2.2.2 (DRMM)) was updated during validation process in the light of request from operational users, which was to add the total number of tile/attribute pairs so that they could more efficiently allocate memory when reading GRIB messages using the proposed template.

Ms Sibylle Krebber, DWD, explained the background of the upgrade, including the new attachment to the Manual on Codes, Definition of “tiles” with time-dependent attributes.

The meeting reviewed the upgraded proposal and agreed to forward the proposal to FT2015-2 as shown in the Annex to this paragraph, including the Appendix in view of the careful validation made.

# 2.3 GRIB new edition

# 2.3.1 New GRIB edition progress[⮉](#Cont_2) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_2_3_1)

Dr Enrico Fucile, ECMWF, the Lead of the Task Team on GRIB (TT-GRIB), informed the meeting that the activity on development of the new GRIB edition has been very slow in the last year as the focus of the IPET-DRMM members was more on the TAC to BUFR migration.

Regardless of such a difficult situation, a set of requirements for the new edition has been consolidated. Dr Fucile presented his consolidated report, which is summarized in the Annex to this paragraph, highlighting "Cost benefit analysis".

Dr Simon Elliott emphasized criticality of governance. The meeting also discussed about reference software. It was pointed that majority of reference software users never see the format documents, then software become de facto standard and nobody care the standard document. The meeting felt risk of one single software implementation in consideration of the time when maintenance ceased.

The meeting discussed this issue of new editions of GRIB and BUFR as a whole, which consensus is shown in the paragraph [3.3.1](#S2015_3_3_1).

# 3. BUFR AND CREX

# 3.1 Amendments to BUFR/CREX regulations

# 3.1.1 Note for encoding geographic coordinates in BUFR and a new element descriptor for encoding coordinate reference systems[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_1_1)

BUFR allows users to encode coordinates describing where observations were made. However, there is currently no way of encoding the coordinate system in which these coordinates should be interpreted. This allows messages to be encoded with latitude/longitude coordinates which may or may not be understood as the producing centre intended, because the reference coordinate system, and in particular its prime meridian, are left to the user's interpretation.

Since external authorities are not referenced in BUFR tables, the coordinates are ambiguous. Even if it is assumed that the prime meridian at Greenwich is used, this meridian is defined in several coordinate systems with differences of more than 100 meters at most latitudes. In addition to these traditional uncertainties, satellite data sometimes use exotic coordinate systems which cannot be properly interpreted using traditional, geostationary coordinate systems.

Ms Sibylle Krebber, DWD, presented the proposal to define in BUFR messages a coordinate system used and on a note for the case a coordinate system is not defined in a BUFR message.

The meeting agreed to forward to validation stage as shown in the Annex to this paragraph.

Mr Yves Pelletier, Meteorological Service of Canada (MSC) and Mr Alexander Kats, Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), supported the proposal and offered to assist validation.

# 3.2 Additions to and modifications of tables

# 3.2.1 New BUFR code table entry for national practice dropsonde data[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_1)

As part of USA’s migration to BUFR, certain fields in the 62626 national practice section of US TAC dropsonde reports (XXAA, XXBB) are required by the US Navy as well as NCEP’s National Hurricane Center (NHC) to be retained in BUFR. This information will be reported using supplementary BUFR Table B descriptors following the standard Table D descriptor 3 09 053.

Mr Jeffrey Ator, NOAA/NWS, proposed two entries not available in BUFR Code table 0 08 040, which will follow the standard template for radiosonde upper-air observations.

The meeting agreed the proposal is forwarded to FT2015-2 as shown in the Annex to this paragraph.

# 3.2.2 New BUFR sequence and elements for GPM Microwave Imager (GMI)[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_2)

During the IPET-DRMM II meeting in 2014, ECMWF submitted a proposal for new entries in BUFR Table B for elements related to the position of a satellite platform required for the development of a BUFR sequence for GPM Microwave Imager (GMI) data.

Dr Enrico Fucile, ECMWF, modified the initial proposal and requested the definition of a “coordinate significance” element with the role of specifying the significance of the subsequent elements from classes 04, 05, 06 and 07, taking into account the suggestions from the IPET-DRMM to define new elements in class 08 (significance qualifiers) rather than using specifications of existing coordinates elements.

It was notified that this new element would be used in the GMI BUFR template and in the Aeolus L2B template which is under development and subject of a different proposal.

The meeting supported the idea and agreed to forward to the validation stage as shown in the Annex to this paragraph with some minor adjustments to width of 0 08 091 and some others.

*Editorial note: this proposal was validated shortly after the meeting and included in the list of FT2015-2.*

# 3.2.3 New parameter in Common Code Table C5 for new satellite JASON-3[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_3)

Jason-3 is the fourth mission in US-European series of satellite missions that measure the height of the ocean surface. It is scheduled to launch in 2015. EUMETSAT and NOAA plan to encode JASON-3 data in BUFR. The data formatting in WMO codes requires a Satellite Identifier entry for this new satellite in Common Code table C-5.

Dr Thomas Heinemann, EUMETSAT, presented the proposal on an entry for JASON-3 in Common Code table C-5.

The meeting is agreed to forward to FT2015-2 unanimously as shown in the Annex to this paragraph.

In this relation, the meeting was invited to consider use of official names of satellite and instruments in the Manual of Codes, which is a strong request by editors of the publication, including spacing and hyphenation. The meeting felt it was practically difficult to assure due to different usage even in an organization but it should be done as much as possible.

### 3.2.4 New BUFR sequence and elements for Atmospheric Laser Doppler Instrument (ALADIN)[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_4)

ECMWF is responsible for the operational implementation of the L2 meteorological processing facility for the Atmospheric Dynamics Mission Aeolus (ADM-Aeolus), which is the first space mission to acquire profiles of wind on a global scale with the Atmospheric Laser Doppler Instrument (ALADIN).

In the context of this activity ECMWF has developed in collaboration with Royal Netherlands Meteorological Institute (KNMI) a new BUFR sequence for level 2B data which are of interest for the assimilation in NWP models.

Dr Enrico Fucile, ECMWF, presented the proposal on a set of BUFR/CREX Table B and BUFR Table D descriptors and associated Code tables. In the sequence, the use of a new significance qualifier for the coordinates was proposed to avoid introduction of new specific location elements in the Table B and to allow more flexibility and reusability of the new proposed elements. The proposed “coordinates significance” (0 08 091) is used also in the proposed sequence for GMI data which is subject of document 3.2.2.

Dr Simon Elliott in his capacity as the chair of CGMS Task Force on Satellite Data and Codes (TF-SDC) expressed this proposal should be sent to the Task Force for their inputs before decision by IPET-DRMM.

The meeting confirmed some issues in the proposal and agreed to forward to the validation stage as shown in the Annex to this paragraph. Dr Fucile will submit the proposal to Dr Elliott as the chair of TFSDC for their consideration.

### 3.2.5 Encoding elements with a large range and limited precision in BUFR[⮉](#Cont_3)

Attempts to validate the encoding of wave observations in BUFR have revealed that BUFR does not have adequate facilities for encoding elements which have a large range and limited relative precision. Examples of such elements include, amongst many others, water wave spectral energy densities, pressure in some vertical profiles, concentrations of some atmospheric constituents, and air density.

Dr Weiqing Qu, BoM, presented his document to seek a good solution on this issue.

Several possible solutions were presented, including

a) Use a scale and magnitude representation to allow the required precision for small values without having an excessively large data width

b) Use existing BUFR operators

c) Define a new “Delayed change of scale” operator

d) Encode the logarithm of the element’s value instead of the value

e) Use a standard IEEE floating point format

f) Use a “floating point” format, with separate sign, exponent and significand sub-fields

Some comments based on experiences are expressed, which are: when the same issue was discussed, the proposed Table C operator (IEEE floating point) was not adopted, but it should be possible to create operators at least for some cases without change editions; there is in general a lack of compression algorism in BUFR; Météo-France needs some compressions in BUFR for conversion from their internal format to BUFR.

The meeting concluded this issue would be discussed when talking about BUFR edition 5.

### 3.2.6 Modification to wave spectra observation template (3 08 015 and 3 08 016)[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_6)

Attempts to validate the encoding of wave observations in BUFR have revealed that the proposed templates 3 08 015 and 3 08 016 have problems. In particular, the ranges and precision represented by several table B descriptors are inadequate.

Dr Weiqing Qu, BoM, presented the new version of these templates, where four types of elements are involved, non-directional and directional spectral energy densities in frequency and wave number representations.

The meeting reviewed the updated version of WAVEOB templates and thanked Dr Qu and Mr Charles Sanders, BoM, for their contribution on developing these templates for common use.

The meeting agreed to forward to FT2015-2 as shown in the Annex to this paragraph with some minor modifications.

*Editorial note: It was decided to keep this at validation stage during the approval process of FT2015-2.*

### 3.2.7 New entry in BUFR Code and Flag Tables[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_7)

BUFR sequence 3 10 011 (ATOVS field of view variables) is one of the most widely-used sequences for satellite observations. This sequence is applied by EUMETSAT to the encoding of ATOVS data from Metop and NOAA satellites. These data are being disseminated via the GTS and EUMETSAT’s EUMETCast DVB multicast service.

Dr Thomas Heinemann, EUMETSAT, presented the proposal on the new entry for the Noise Equivalent Delta-Temperature (NEdT) to improve the quality filtering.

Since the modification of sequence 3 10 011 is not recommended due to its widespread application by a large number of users, Dr Heinemann proposed the information to be added in the form of first order statistics. However, the initial proposal did not find support from the participants due to other possible better solution (not using statistical process).

The meeting reviewed the proposal at the TT-BUFR side meeting and recommended to change the proposal to use Class 33 descriptors instead as shown to the Annex to this paragraph. The proposal is forwarded to FT2015-2.

### 3.2.8 New Descriptor for radar data products[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_8)

DWD changed the radar composite routines to a new system. In this context the BUFR-format was updated. Especially more meta-information is given. Currently the used descriptors are in the local table version 8 from originating centre 247 sub-centre 0. Such products are already exchanged within OPERA.

Ms Sibylle Krebber, DWD, proposed several descriptors in BUFR/CREX Table B to facilitate further international exchange of these products under the generating centre 78 / sub-centre 10.

The meeting reviewed the new descriptors. It was pointed that BUFR and CREX have different scale factor in the proposed four descriptors and data length of 33 might not fit the 32 bit architecture of processors. Moreover, it was suggested to use significance qualifier for latitude/longitude origin and those should be in coordinate class. Generalization of 0 29 017 name was also invited.

Ms Krebber expressed to consider the comments and these will be reflected during validation process.

The meeting agreed to forward to validation stage as shown in the Annex to this paragraph.

### 3.2.9 New BUFR code table entry for one-hour and n-minute data from AWSstations[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_9)

China Meteorological Administration (CMA) is planning to migrate from national code forms to WMO BUFR for AWS observations. The national BUFR templates for AWS observations from one-hour period and n-minute period are developed.

For some regional AWS are settled on the flat roof of the building, so new code figure is needed in the code table for descriptor 0-08-010 to identify such kind of situation.

Ms Fang Zhao, CMA, proposed the new entry in the code table. The name of the new entry was discussed for clarification. Ms Zhao accepted to the suggested change of the name in consultation with colleagues in CMA.

The meeting agreed to forward to FT2015-2 with the adjustment of element name as shown in the Annex to this paragraph.

### 3.2.10 New BUFR code table entries for radio occultation data of FY-3C[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_10)

Global Navigation Satellite System Occultation Sounder (GNOS) loaded on FY-3C is the first civil-use radio occultation sounder of China. It can be compatible with GPS and BDS (BeiDou navigation satellite system).

CMA is planning to produce BUFR message of radio occultation data from GNOS. The BUFR template for radio occultation observations was developed.

Ms Mi Liao, CMA, presented the new code figures in 0 02 019 and 0 02 020.

The meeting agreed to forward to FT2015-2 as shown in the Annex to this paragraph.

### 3.2.11 New BUFR code table entries for high resolution radiosonde data[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_11)

CMA is planning to produce high resolution BUFR message of upper-air observations for domestic dissemination. The national BUFR template to present high-resolution radiosonde observations is developed.

Ms Fang Zhao in cooperation with Ms Ying Wang and Mr Guaiguai Liu presented the proposal on new code figures for the high resolution radiosonde data.

Mr Alexander Kats, Roshydromet, proposed additional two entries in the 0 02 066 and Ms Zhao accepted to include them in her proposal. In relation to her proposal, Ms Zhao had a question what type of information should be in tables. The meeting felt necessity of some regulations to fill the code tables in that regard.

Some other discussions were made on similar entries in code tables, 0 02 095 and 0 02 097 in the proposal and entry names in 0 35 035. Ms Zhao reviewed the suggestion in cooperation with her colleagues in CMA.

The meeting agreed the proposal to be forwarded to FT2015-2, reflecting some modifications suggested as shown in the Annex to this paragraph.

### 3.2.12 Revision of BUFR sequence 3 02 067[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_12)

The sequence 3 02 067 (additional synoptic parameters) was first proposed in 2010. Revisions were proposed in 2011 and 2012. This sequence is meant for encoding all parameters in BUFR which could be encoded in FM12 SYNOP so far (e.g. a huge amount of possible 9SPSPspsp groups in section 3).

Ms Sibylle Krebber, DWD, explained briefly the history of the development of 3 02 067. In the last years no further comments and requirements had been received. Therefore the validation process should be finalised.

Ms Krebber expressed only a minor revision was reasonable in the amount of descriptors at the delayed replication of the “visibility in different directions”. She informed that validation would be completed shortly.

The meeting agreed without any comments to forward to FT2015-2 as shown in the Annex to this paragraph, provided the validation is duly finished.

### 3.2.13 New BUFR elements and sequence for international exchange of Road Weather Information[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_13)

Based on several recent bilateral data exchange activities with neighbouring countries, DWD motivated the resumption of the development of a BUFR template for cross-border exchange of Road Weather Information. The aim is to facilitate the standardised transmission of this data within the WMO framework and, specifically, to include descriptors in the WMO BUFR tables that have thus far been used as local descriptors in a template for bilateral road weather data exchange between the Czech Hydrometeorological Institute (CHMI) and DWD.

In 2007, Dr Eva Cervená, CHMI, presented a proposed BUFR template at the ET-DR&C meeting, ex-expert team to deal with WMO coding issues. The template was designed to allow the bilateral exchange of road weather data between the national weather services CHMI and DWD. The purpose was to inform about this development in the context of the Regional TDCF Migration Plan. The presentation resulted in a discussion between Mr Stanley Kellett, UK Met Office, and Dr Cervená, but ebbed away over the following years.

Ms Sibylle Krebber, DWD, explained the background history of the proposal and presented the new proposal to continue the standardization of road weather information encoded in BUFR.

The meeting reviewed the proposal. Some minor adjustments were suggested in particular based on the difference from traffic rules and measurement units. Ms Krebber accepted to reflect the suggestions and adjustments will be made during validation process.

The meeting agreed to forward to validation stage as shown in the Annex to this paragraph.

### 3.2.14 New sub-category entries in BUFR Table A for radiation and acid rain data[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_14)

The national BUFR templates for radiation observations from one-hour and n-minute period and for acid rain observations are developed in China. So new BUFR sub-category entries are needed in common code table C-13 to identify these data in BUFR.

Ms Fang Zhao, CMA, presented the proposal.

It was pointed that the GTS abbreviated headings to be exchanged need to be considered, including applicability and feasibility of pre-operational introduction, in parallel. The meeting felt it is not specific issues for these proposals but common to all that follow exchange of the new data and products.

The meeting agreed to forward to FT2015-2 as shown in the Annex to this paragraph.

### 3.2.15 Synoptic reports from sea stations suitable for VOS observation data[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_15)

Dr David Berry, representative of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), presented through the teleconference system the updated version of the sequences and associated descriptors for reporting synoptic reports from sea stations suitable for VOS observation data approved for validation at the second meeting of the IPET-DRMM (IPET-DRMM II).

Dr Berry explained the primary change to the sequence is to take into account comments at IPET-DRMM-II and to use Class 03 descriptors for reporting of humidity and air temperature instrumentation common to both land and marine observations. Other changes include: the addition of a unique identifier for the report; the addition of information on the method used to adjust pressure observations to sea level; and the addition of sequences to allow the reporting of limited bio-geochemical data on the GTS in response to requests from E-SURFMAR. These data are presently observed and reported in real-time but not currently shared on the GTS.

The reporting of ocean turbidity requires the addition of a new unit to BUFR - nephelometric turbidity units (NTU), which is the measurement unit used by the oceanographic community for the measurement of turbidity and is measured directly using instruments calibrated against a standardized sample.

The meeting evaluated details of the proposed templates and relevant amendments. The proposal contains 3 02 064, which has been already validated and approved to forward to FT2015-2 in the agenda item 4.2.

Some comments were made, for example, on duplication of code tables for humidity and temperature sensor, capacity of proposed thermometer table and configuration of louvers table (both six entries) and naming of renamed existing entry (0 11 104).

Dr Berry expressed some comments including above will be reviewed in JCOMM. The proposal is kept for validation, except for 3 02 064, as shown in the Annex to this paragraph.

The meeting thanked Dr Berry for his efforts taken for these collaborative works with the team and participation in this meeting from early morning.

### 3.2.16 Proposal for a new entry in 0 02 083[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_2_16)

There are several systems for fully automated upper-air observations, produced in China, Finland, France and Japan, for use for unmanned autonomous operation.

In view of unceasing danger of the Common Code C-2 “Radiosonde/sounding system used” it seems to be impractical to continue existing practice of allocating new code figures in C-2 associated with use of unmanned sounding systems, like

 Before 66 66 Vaisala RS80/Autosonde (Finland)

 Before 73 73 Vaisala RS90/Autosonde (Finland)

 Before 81 81 Vaisala RS92/Autosonde (Finland)

03/11/2011 24 124 Vaisala RS41/AUTOSONDE (Finland)

03/11/2011 42 142 Vaisala RS41 with pressure derived from GPS height/AUTOSONDE (Finland)

Mr Alexander Kats, Roshydromet, proposed to use a new entry in Code table 0 02 083 “Type of balloon shelter” to indicate the automated (unmanned) sounding system used instead as shown in the Annex to this paragraph.

Mr Kats mentioned this was connected to the proposal on additional information in the agenda 5.2.

The meeting reached a consensus that this important and complicated issue should be studied further, in particular, from users' perspective in association with the issue of additional information in the agenda 5.2, including the location of the descriptor (before or after main template).

# 3.3 BUFR and CREX new editions

### 3.3.1 On the timely addition of new data representation features and the impact of requested changes in BUFR Editions 4 and 5[⮉](#Cont_3) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_3_3_1)

Mr Yves Pelletier, de facto Lead of the Task Team on BUFR (TT-BUFR), noted that numerous feature requests are on the record for BUFR edition 5. Mr Pelletier further noted that several of these requests were initially made for the current edition 4, but after discussion, were slated as proposals for BUFR edition 5 instead. The argument on BUFR new edition has revolved around the impact that would incur software development costs for operators. It has long been a major criterion for the team, that is, the software specification for the encoder/decoder shall remain unchanged within a given BUFR edition.

Mr Pelletier presented the new change management strategy for BUFR editions 4 and 5, which is shown in the Annex to this paragraph, along with the design goals, such as universality in the representation of data and metadata, extensibility and compactness.

Mr Pelletier expressed that it might not be helpful, in the bigger picture, to put further development off for years until WMO Members were ready with a new, all-encompassing, specification for the next BUFR edition. He doubted that the approach met all the adaptability requirements stemming from developments in Earth observation data.

Mr Pelletier felt some Members will request new features to meet a growing set of operational needs and, on the other hand, many Members will indicate a preference that BUFR remains unchanged in order to reduce the need for migrations to new edition and to promote operational stability. He believed that it was likely that BUFR edition 4 would remain in use for a significant period of time.

Keeping above in mind, Mr Pelletier categorised the possible options on an impact basis as follows.

a) Light impact: New features have limited scope

 This does not affect the encoding/decoding of past or future data and products that do not use them. In most instances, introducing a new operator would be in this category. It would not require a change in edition number in analogy with the fact that new product definition templates of GRIB edition 2 do not accompany new edition numbers.

b) Medium impact: New features result in backward incompatibility of the bit pattern within BUFR messages

 The new features require no change to the Data Description Syntax (DDS). The existing elements and structures of Table B and D are preserved, but the new feature produces different binary streams. This is conceptually similar with previous transitions from edition 2 to 3 and from edition 3 to 4.

c) Major impact: New features result in backward incompatibility of Table B and/or Table D

 The new feature alters the DDS, such as changes that would be required to make BUFR compliant with the ISO 19000 family of standards. Table B and/or Table D would not be compatible across BUFR editions. This requires a new edition number. The scope of the changes induced by such new features is comparable with the migration from GRIB edition 1 to GRIB edition 2.

After discussion, it was agreed to push forward with the next editions of GRIB (edition 3), BUFR (edition 5) and, if needed, CREX (edition 3).  Specifications for these next editions will be worked out by the TT-GRIB and TT-BUFR during the coming year and are due to be presented for final approval during the 2016 meeting of the IPET-DRMM, which will allow them to then go forward to the 2016 session of CBS for final approval.

There are many ideas that have been collected over recent years for inclusion in future editions, but given the short time frame, the task teams will select for inclusion in the next editions only those items that are of the utmost importance to the meteorological community but also expected to be minimally impactive to those who don’t require the use of the new features. The idea is to initiate a cycle of incremental updates to these codes forms, whereby new features could be added, if needed, and subsequent new editions approved during each subsequent session of CBS, rather than continuing to collect large lists of ideas for one big edition change to each code form at some indeterminate point in the future. This incremental approach will make the code forms more adaptable and responsive to the current and future needs of the meteorological community.

# 4. SUMMARY AND CONCLUSION OF PROPOSALS

# 4.1 Summary on amendments after IPET-DRMM-II[⮉](#Cont_4) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_4_1_imp)

In accordance with the current *Procedures for Amending the Manual on Codes*, sets of amendments were approved and implemented or waiting for implementation as shown in the Annex to this paragraph during the intersessional period of the IPET-DRMM without going through CBS and EC sessions. This is to place these amendments on record, which are not dealt by sessions of the Commission for Basic Systems (CBS) anymore.

Proposals on amendments to GRIB edition 2 (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.

# 4.2 Conclusion on past proposals (in lieu of PFC)[⮉](#Cont_4) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_4_2)

Mr Yves Pelletier, MSC, Ms Sibylle Krebber, DWD, Mr Jeffrey Ator, NOAA/NWS and Dr David Berry, JCOMM, presented their validation reports, which are:

For GRIB,

a) New parameters and fixed surface types to represent ground surface conditions in analyses or models

b) Tile template for GRIB2

For BUFR/CREX,

c) BUFR descriptors for dual-polarization radar data

d) Validation of sequence 3 02 064 (Ship/or other marine platform wind data)

e) Validation of additional Argo BUFR Sequences

These are proposals already approved for validation by the previous meetings of IPET-DRMM or its equivalent team.

The meeting reviewed all these reports and concluded validations have been duly completed, and agreed to forward these proposals to FT2015-2 unanimously.

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

### 5.1 Clarifications of B/C 30 and B/C 32 Regulation[⮉](#Cont_5) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_5_1)

The second meeting of IPET-DRMM in College Park (2014) recognized the need for clarification of B/C 30 and B/C 32 with respect to the specification of time period for the various regional reporting practices, to which CLIMAT and CLIMAT SHIP refer, in response to the document submitted by Dr Eva Červená, CHMI.

The IPET-DRMM-II approved the majority of proposed amendments to B/C regulations, which will be implemented on 4 November 2015, except those for reporting of monthly precipitation data, the period of which begins on the last day of the previous month. Eventually, the B/C 30.4.4 and 32.4.4 proposed for that purpose were withdrawn by Dr Červená and Mr Alexander Kats, Roshydromet, as controversial.

The IPET-DRMM-II noted that the existing 3 07 073 (Representation of CLIMAT data of the actual month and for monthly normals) and 3 08 013 (Representation of CLIMAT SHIP data of the actual month and for monthly normals) are not applicable to the cases when the period for monthly precipitation data starts on the last day of the previous month in UTC.

Keeping above in mind, Dr Červená developed the new templates, TM 307078 for CLIMAT and TM 308023 for CLIMAT SHIP, along with new B/C 30.4.4 and 32.4.4 in compliance with the regional or national reporting practices for monthly precipitation data, the period of which starts on the last day of the previous month in UTC. The templates have already been approved separately through the fast-track last year and implemented on 5 November 2014.

Mr Kats, Roshydromet, presented the proposal on B/C 30.4.4 and 32.4.4 slightly modified from last year's proposal.

The meeting thanked Dr Červená and Mr Kats for their efforts to resolve the issue of time period representation in climate reporting.

The meeting agreed to forward the modified B/C 30.4.4 and 32.4.4 to adoption between CBS sessions as shown in the Annex to this paragraph.

### 5.2 Strategy for amending Annex II to B/C 25 Regulations[⮉](#Cont_5) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_5_2)

Upper-air data users highly welcome including additional metadata into upper-air BUFR messages beyond TM309052. Composition of additional metadata descriptors is defined by the B/C 25 Annex II “List of parameters for representation of additional information on sounding instrumentation”.

Mr Alexander Kats, Roshydromet, explained the background of his document to facilitate the discussion by experts around the table. Mr Kats added the list in the Annex II, however, seemed not exhaustive. Other metadata worth to be included are:

0 02 066 Radiosonde ground receiving system

0 02 103 Radome

0 02 015 Radiosonde completeness

0 02 016 Radiosonde configuration

0 02 080 Balloon manufacturer

0 02 083 Balloon shelter

0 02 085 Amount of gas used in balloon

0 02 086 Balloon flight train length

0 35 035 Reason for termination

Mr Kats emphasized that additional metadata to upper-air BUFR reports were optional in B/C 25.11, which results in different requirements from WMO Members and is a source of criticism from upper-air equipment manufacturers. He added there was also a criticism that BUFR recommendations are moving so fast. He was concerned that it might be too risky to change B/C 25 regulations during the current phase of the migration and therefore requires careful discussion.

The meeting pursued a pragmatic solution, keeping in mind that including additional metadata is hardly possible if data are produced and collected in traditional TEMP codes.

The meeting initially considered the ideas to add new metadata after the existing upper-air BUFR template to avoid the impact of adding them prior to the template, however, later it was recognized that the addition after the template contradict the BUFR syntax, which coordinates are applied to the following descriptors.

The meeting gradually moved to the idea to comply with the BUFR syntax, and finally agreed the proposal, including additional notes in the B/C 25, to be approved through the procedure for adoption between CBS sessions, which was drafted by Mr Kats and Mr Jeffrey Ator, NOAA/NWS as shown in the Annex to this paragraph. It decided that the template 3 01 128 to be in the Annex II to B/C 25 should also be introduced separately in BUFR Table D by FT2015-2 to facilitate preparation by Members and manufactures.

In relation to this amendment, the meeting noted importance of manufactures' role in validation.

*Editorial note: After the meeting, Ms Hasegawa, JMA, suggested a change to the proposal in consideration of an expected proposal for GRUAN template or sequence, which is shown in the [Alternative to Annex to Paragraph 5.2](Report_IPET-DRMM-III_Beijing_annex.docx%22%20%5Cl%20%22AA2015_5_2).*

### 5.3 Clarification of upper-air wind reporting nearby the Poles[⮉](#Cont_5) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_5_3)

Some stations, such as drifting ice stations by Russian Federation and an upper-air station by USA, have been operated at the North or South Pole, where wind direction is reported in accordance with the Code table 0878 (True direction, in tens of degrees, from which wind is blowing (or will blow) at stations within 1° of the North Pole).

The Code table 0878 is applied to several TAC, such as SYNOP and SHIP, but not to PILOT and TEMP families. In the same way, the respective notes to Class 11 of BUFR/CREX Tables B and to B/C 01 and B/C 10 in the Manual on Codes (WMO-No.306), Vol. I.2 apply only to surface wind.

The sixteenth session of the Commission for Instruments and Methods of Observation (CIMO-XVI (2014)) has approved the Provisional 2014 Edition of the Guide to Meteorological Instruments and Methods of Observation (CIMO Guide), which states in Chapter 13 (Measurement of upper wind) upon request by Mr Alexander Kats, Roshydromet:

 “Within 1° latitude of the north or south pole, surface winds are reported using a direction where the azimuth ring is aligned with its zero coinciding with the Greenwich 0° meridian. This different coordinate system should be used by all fixed and mobile upper-air stations located within 1° latitude of the north or south pole for wind direction at all levels of the entire sounding, even if the balloon moves further away in latitude greater than 1° from the pole. The reporting code for these measurements should indicate that a different coordinate system is being used in this upper-air report, in particular if encoded in traditional alphanumeric codes; location of the station in BUFR automatically indicates usage of this different coordinate system”.

Mr Kats explained the background of his proposal, by which he requested the amendments to the Manual on Codes (WMO-No. 306), Vol. I.2 in compliance with the Chapter 13 above, because the Volume I.1 has been frozen except for aviation codes.

The meeting recognized that the amendment to the note to Class 11 was generally applied not only to surface-based upper-air observations but also to satellite observations. It therefore agreed the proposed amendments to B/C regulations, which are sufficient for the upper-air observations, as shown in the Annex to this paragraph in compliance with the CIMO Guide, withdrawing the amendment to the note to Class 11 of BUFR/CREX Table B.

# 6. TRADITIONAL ALPHANUMERIC CODES

# 6.1 Amendment 77 to ICAO Annex 3[⮉](#Cont_6) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_6_1)

Mr Neil Halsey, International Civil Aviation Organization (ICAO), presented through teleconference system the proposal consequential by the Amendment 77 to ICAO Annex 3.

Mr Halsey explained that the only part of the amendment, which affected the WMO codes, was the removal of reporting of RERASN in the supplementary information of METAR and SPECI. In this regard, it was proposed to add a short clarification text to the Regulation 15.13.2.1 in METAR/SPECI.

Mr Halsey informed that the ICAO Air Navigation Commission (ANC) final review of Amendment 77 will take place most likely in October 2015 and the final adoption by the ICAO Council would be expected in March 2016 with applicability in November 2016. He expressed the applicability date was in November 2016 or any date deemed agreeable between the ICAO and the WMO.

Mr Halsey added that it is also expected that the state of runway groups in METAR/SPECI would be proposed for removal altogether, which was being proposed for applicability in November 2018 in accordance with the change of ICAO Annex revision cycle (currently 3 to 2).

Mr Halsey further added that the ICAO Annex 3 would be divided into two publications and its technical part would be separated into PANS-MET, new publication. He emphasized it was a plan not to take place until 2020.

Further to the above, Mr Halsey emphasized the recently developed IWXXM, including code lists, which had been approved by the WMO Congress, would need to be updated in line with the alphanumeric codes. Dr Enrico Fucile, Lead of TT-AvXML, expressed that it might not be trivial to delete the entry from the code registry, but the TT will discuss to find a technical solution for this amendment. Dr Fucile added it could not be done at this meeting with no expertise.

Mr Halsey expressed his concern on problems, which would be caused by the change of approval cycle from 3 to 2 years at ICAO side, in collaborative amendments to the Annex 3 and the Manual on Codes. He thought it was expected that amendments would be more acute due to the change, and mentioned that in the future amendments WMO should propose much time is to be allowed for adopting amendments to the Manual on Codes.

The meeting shared his concern and thanked Mr Halsey for his continual efforts for collaborative work between two organizations and Mr Yves Pelletier, the Lead of TT-AvCI, for his active communication with ICAO Secretariat to achieve the tasks of TT-AvCI.

The meeting agreed the amendment to METAR and SPECI with a slight modification as shown in the Annex to this paragraph.

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

# 7.1 Status of migration by WWW Monitoring Exercise[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_1)

The meeting was informed of the results of the Special MTN Monitoring (SMM) on reports exchanged in BUFR during 1-15 April 2015, which are shown in the Annex to this paragraph and summarized below.

Surface BUFR reports: Green (availability 90-100%) is dominant in both SYNOP and BUFR [Region VI]. While green is dominant in SYNOP, a large number of yellow (equal or less than 45%) are seen in BUFR [Region II]. Green is dominant in SYNOP and red (0%) is dominant in BUFR [Region IV]. This would show progress of the migration.

Red is dominant but green (north and south east) and yellow (central) are seen in both SYNOP and BUFR [Region I]. Red or blue (45-90%) is seen in both SYNOP and BUFR [Region III]. Green or red is seen in both SYNOP and BUFR [Region V]. This would show the migration has progressed where TAC data are available.

Upper-air BUFR reports: Green is dominant in both TEMPs (TEMP, PILOT and its family) and BUFR [Regions IV, VI]. Green is seen in both TEMPs and BUFR [Regions II (east), III (central), V (north and east)]. Yellow or blue is seen in both TEMPs and BUFR [Regions II (south), V (south)]. However, a large number of green in TEMPs and red in BUFR are seen [Region II (north)]. This would show the migration has progressed where TAC data are available but there would be possibility of further improvement. Red is dominant in both TEMPs and BUFR [Region I]

Climate BUFR reports: The migration has completed where TAC data are available [Regions II, III, VI]. There would be possibility of further improvement [Regions I, IV].

The meeting was invited to refer to the result as needed when discussing migration issues.

# 7.2 Reports by members on status of migration

### 7.2.1 Status of migration in RA I[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_2_1)

Mr Samuel Machua, Kenya Meteorological Department (KMD), reported the status of migration to TDCF in Region I, which summary is as shown in the Annex to this paragraph along with his recommendations to facilitate the migration in the region.

Mr Machua emphasized that the migration has been a challenge to most of the National Meteorological and Hydrological Services (NMHSs) in Region I. The major setback in TDCF migration is lack of encoding software. He added, however, some NMHSs have made efforts to implement encoding systems and started transmitting BUFR messages to GTS (mainly SYNOP). Although most of them have had some training on TDCF, the survey carried out in 2014/2015 indicates that many NHMSs in the region still were lacking capacity to implement TDCF operations.

The report Mr Machua presented described the current status especially in East and South Africa sub region. He expressed the migration status in all NMHSs in the region could not be completely established because of difficulties in contacting the focal points. Other source of information on countries exchanging TDCF data was the newly installed WIS portal in Nairobi (though not yet commissioned) and Météo-France GISC in Toulouse.

Mr Machua mentioned the use of CREX in the region has not been considered seriously. It was informed that training on CREX to ASECNA intended to have an internal format to report PILOT and TEMP through SMS.

The meeting thanked Mr Machua for his active involvement in the migration initiative in Region I.

### 7.2.2 Status of migration in RA II[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_2_2)

Mr Kentaro Tsuboi, Japan Meteorological Agency (JMA), presented the status of migration to TDCF in Region II on behalf of Ms Jitsuko Hasegawa, Theme Leader in Data Representation and Metadata in Region II, who unfortunately could not attend the meeting in person.

Ms Hasegawa has monitored the status and given technical assistance as well as has conducted a survey on migration status on a regular basis. The monitoring results of migration status of RA II Members as of April 2015 and related activities by RA II Members during the period between May 2014 and July 2015 are shown in the Annex to this paragraph.

Mr Tsuboi reported Vietnam has started dissemination of BUFR messages (surface and upper-air) and Bhutan has connected to RTH (GISC) New Delhi after the previous meeting of IPET-DRMM.

The meeting thanked Mr Tsuboi and Ms Hasegawa for their continuing efforts to assist migration in the region.

Ms Fang Zhao, CMA, reported the activities in China on migration TDCF. Ms Zhao stated that within China both SYNOP TAC and BUFR data are converted directly from native format reports in parallel now after collected at national level, and then disseminated on GTS, while BUFR TEMP data are still converted from TAC message. She added that all the BUFR messages collected from GTS would be ingested into the operational database system by the end of this year and be available to the end users.

Ms Zhao explained the CMA's strategy of migration from native format to universal code form. Types of data under consideration are: surface, upper-air, radiation, SHIP and BUOY, GNSS/MET, lightning, wind profiler, acid rain, aerosol and agricultural and ecological observations.

Ms Zhao added the pilot project of generating BUFR data from on-site software would be implemented this year for above types of data, using national templates. She emphasized that some issues are raised as shown in the Annex to this paragraph, which were at times expressed in the discussions on the items 3 of this meeting.

The meeting thanked Ms Zhao for her contribution to the migration project and the initiative for migration by CMA.

### 7.2.3 Status of migration in RA III/Migration to BUFR in Brazil[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_2_3)

Mr Jose Mauro de Rezende, Instituto Nacional de Meteorologia (INMET), reported the status of migration mainly in Brazil. The migration towards TDCF in Brazil and Region III started first with RTH Brasilia, converting from TAC “on the fly” by the Message Switching System to TDCF. It still continues but RTH Buenos Aires took this task for the southern countries in the region.

Some National Centres in Region III, mainly Santiago and Maracay, had implemented BUFR applications to generate reports directly from their local data base. Other centres are working in similar way to have a tool to create the BUFR bulletins, such as Quito, Montevideo and Lima.

The status of migration on specific data types are summarized in the Annex to this paragraph. The meeting thanked Mr Rezende for his leading role in Region III for the migration.

### 7.2.4 Status of migration in RA IV/Migration to BUFR within the U.S.A./ Status of the MTDCF in Canada[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_2_4)

Mr Yves Pelletier, MSC, presented the status of migration to TDCF in Region IV on behalf of Mr Glendell De Sousa of the Caribbean Meteorological Organization who unfortunately did not attend the meeting in person.

The status of migration in the region kindly provided by Mr Sousa is summarized in the Annex to this paragraph. Ten Members have migrated to TDCF at least as to SYMOP and the migration is in progress in seven Member states.

Mr Pelletier then summarized the status of migration to TDCF in Canada.

a) SYNOP bulletins available in BUFR parallel to TAC in June 2015, full international and CMC NWP validation to follow. These are all SYNOP reports in bulletin form (collected).

b) Approximately half (15 of 31 sites) produce TEMP and PILOT reports from on-site software

c) Drifting buoys produce BUFR in a provisional template

d) Moored buoys, SHIP, and CLIMAT reports are still available in TAC only. The migration is in work plans, but prior requirements need to be fulfilled in order for the migration work to begin.

The details on SYNOP and Radiosonde data in BUFR are shown in the Annex to this paragraph.

The meeting thanked Mr Pelletier and Mr Sousa for their efforts and initiative to facilitate the migration to BUFR.

Mr Jeffrey Ator, NOAA/NWS, presented the status of migration in United States of America.

Mr Ator reported there had been considerable progress towards migration within the USA during the past year. NWS, which has primarily responsibility on the civilian side of the US weather community, has been meeting regularly with counterparts on the military side (e.g. US Navy, US Air Force) to discuss issues and coordinate progress, as well as disseminate information and promote awareness of the migration throughout the rest of the US community.

Mr Ator highlighted the recent chartering of a project within NWS, which was to deliver high-resolution radiosonde data from the US Radiosonde Replacement System (RRS) to the GTS, and to replace BUFR data currently generated from separate TAC TTAA, TTBB, etc. parts for all NWS-controlled radiosonde sites. He reported the project, expected to be completed within the next 7-8 months, will deliver soundings with data levels every 1 second of the ascent (for upwards of 6000 total levels per sounding) in full accordance with the B/C 25 regulations. A few preliminary samples have already been generated and made available to the US Navy and Air Force and ECMWF for review.

Mr Ator expressed further that USA was encountering issues with regards to efforts by USA to assimilate migrated BUFR data from the entire world community, some of which are shown in the Annex to this paragraph, such as discoverability and quality of BUFR messages.

The meeting was informed that GISCs/RTHs need to update discovery metadata catalogues, which are automatically synchronized with others and to notify WMO Secretariat of update of Volume C1. The information is released from Operational Newsletter from WMO web site. Regarding quality, it was also informed that BUFR checker by ECMWF is to check BUFR format not contents.

The meeting noted with anticipation the project for high-resolution radiosonde data and thanked Mr Ator for his initiative in USA for the migration.

### 7.2.6 Status of migration in RA VI[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_2_6)

WMO/RA VI/Task Team on Migration to Table Driven Code Form (TT-MTDCF) was re-established within the Working Group of Technology Development and Implementation. Mr Alexander Kats, Roshydromet, has taken over the leadership of the TT from Dr Eva Červená, CHMI, who is still providing guidance and assistance to Mr Kats.

Mr Kats expressed that the TT provides guidance and assistance to the Members on issues related to the migration, in particular, in resolving various issues between data producers and user community as well as between data producers and software providers, which is sometimes quite painful due to lack of the ultimate authority able to confirm or disprove complains to software providers.

Mr Kats explained a survey on BUFR bulletins with SYNOP, CLIMAT, PILOT and TEMP data from RA VI Members, arrived to Moscow WMC/RTH during 04/06-19/06/2015 (for CLIMAT data - since 01/06/2015). The result is shown in the Annex to this paragraph. The results of survey along with the present and previous IPET-DRMM meetings, CBS-Ext.(2014), Cg-17 (2015) outcomes and other related to the Migration information are about to be circulated among RA VI focal points along with request to update the Regional Plan for the migration to TDCF in Region VI.

Mr Kats emphasized importance of oversight over content was clearly demonstrated when NWP centres refused using “reformatted” upper-air BUFR messages. He added it seemed the main challenge of the current phase of Migration and requires consolidation of all available resources, because comprehensive content analysis seemed unachievable with resources available from the TT-MTDCF.

Mr Kats had a question on necessity of CLIMAT data by climate community, which his Roshydromet colleagues believed could be created from SYNOP messages. It was informed that CCl was moving to Daily climate data.

The meeting thanked Mr Kats and Dr Červená, ex-member of IPET-DRMM, for their contribution to the migration achieved and future in the region.

# 7.3 Follow-up of migration to TDCF, including issue of partitioned TEMP BUFR messages

# 7.4 Migration Strategy for BUFR TEMP[⮉](#Cont_7) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_7_3)

The Commission for Basic Systems Extraordinary Session (CBS-Ext.(2014)) took place in Asunción, Paraguay, 8-12 September 2014. It asked the OPAG-ISS to review progress with migration every six months and to consider whether a further extension of six months was required to resolve issues with the consistency and quality of data.

CBS-Ext.(2014) did not make any changes to the migration matrix, while it felt some measures were necessary to facilitate and complete the migration, including:

(f) Noting the imminent November 2014 deadline, IPET-DRMM should prepare a report to be sent to Permanent Representatives of Members with WMO to communicate migration successes and remaining issues;

Ms Jitsuko Hasegawa, a co-chair of IPET-DRMM, has played a role in drafting the report in association with some active contributors. The draft has been endorsed by the chair of IPET-DRMM and will be ready to be presented to the PRs of WMO Members. Issues identified by the report are listed along with recommendations in the Annex to this paragraph.

The CBS Management Group (CBS-MG) noticed difficulty in data processing by NWP centres with regard to upper-air reports in BUFR converted from massages in FM 35 TEMP, FM 32 PILOT and their family (TAC TEMP and PILOT, FM 35, 36, 37, 38 and FM 32, 33, 34). In view of its urgent and critical nature, the president of CBS has approved a letter on migrating upper-air report to BUFR, which was posted on 7 July 2015 to the Permanent Representatives of WMO Members. It urges continuing transmission of TAC TEMP parts A, B, C, and D, if it is unable to produce upper-air BUFR reports that contain complete ascents.

https://www.wmo.int/edistrib\_exped/grp\_has/index.php?dir=\_en/&file=2015-07-07-PR-6855-OBS-WIS-DRMM\_en.pdf

Importance of the issue was emphasized by Mr Richard Weedon, UK Met Office, through teleconference system. In his document, Mr Weedon mentioned that testing in the past 18 months had highlighted a flaw in the ability of many data producers to produce BUFR TEMP in compliance with B/C 25. In particular, four BUFR messages corresponding to individual Part A to D of an ascent TEMP observation have posed a number of problems primarily in the identification of the four messages with identical abbreviated headings on GTS. He added NWP community has continued to oppose the introduction of any data not fully comply with the B/C 25.

The meeting reviewed the issues and recommendations in the DRMM status report on migration, and discuss further measures to facilitate migration, as also summarized in the Annex to this paragraph.

The meeting concurred on the need for the actions to:

a) Create a check list based on what are summarized in the DRMM status report on migration,

b) Remind people of procedures for reporting issues with data and how it should be done, e.g. by focal points and GTS procedure,

c) Make sure necessary steps are documented to announce the change on migration by METNO, Newsletter, email to focal points.

With respect to the issue of partitioned BUFR messages, the consensus of meeting was that it was against the B/C regulation that requests to report data up to 100 hPa at first and then of entire observations, which is to meet the requirements from NWP community pursuing better quality and rich contents as much as possible.

# 8. MANUAL ON CODES

# 8.1 New procedures for amending the Manuals on Codes and the GTS[⮉](#Cont_8) [Annex](Report_IPET-DRMM-III_Beijing_annex.docx#A2015_8_1)

The Commission for Basic Systems (CBS) Extraordinary Session (CBS-Ext.(2014)) (Asunción, Paraguay, 8-12 September 2014) recommended the new *Procedures for Maintaining Manuals and Guides Managed by the Commission for Basic Systems* (Rec.15 (CBS-Ext.(2014))). The Recommendation has been adopted by the World Meteorological Congress Seventeenth Session (Geneva, 25 May to 12 June 2015).

Prior to the new Procedures, the Manual on Codes had the *Procedures for Amending the Manual on Codes* (Rec.4 (CBS-XII)/Res.4 (EC-LIII)) since 1 July 2001, which were to introduce the fast-track procedure by the President of WMO. The previous Procedures were revised on 1 July 2009 to introduce the *Procedure for Adoption between CBS Sessions*.

The new Procedures have replaced the previous ones on 1 July 2015[\*](#EN_8_1). Some generalizations have been made in the new ones for making the procedures applicable to other Manuals and Guides.

The meeting confirmed the new procedures one by one on how each article was applied to amendments to the Manual on Codes, and agreed the same procedures as the previous ones could be applied generally also under the new procedures. The meeting consensus is shown in the Attachment to this paragraph.

In relation to the discussion, an additional issue, i.e. global and community standards, was discussed for the future, which is to categorize BUFR or GRIB templates, for example, into two: one for a specific community and the other for global use and to reduce unnecessary efforts for validation.

However, the idea of global and community standard could not obtain any support from the meeting, which agreed instead to decide what type of validation was required on a case by case basis for each proposed amendment.

*Editorial note: it was confirmed later that the date was changed by Cg to 1 January 2016.*

# 8.2 Separation of GRIB edition 1 from the Manual on Codes[⮉](#Cont_8)

The GRIB edition 1 (GRIB1) was introduced in the Manual on Codes (WMO-No. 306) on 1 November 1987 (Rec.8 (CBS-Ext.(85))/Res.4(EC-XXXVIII)).

When the GRIB edition 2 (GRIB2) was adopted (Rec.5 (CBS-XII)/Res.4 (EC-LIII)), the Commission for Basic Systems (CBS) noted "GRIB edition 1 was still a valid code and would remain in use, for example, for aviation purposes" (general summary 6.2.103, abridged final report of CBS-XII). The GRIB2 became operational on 7 November 2001.

In 2006, the CBS-Ext.(06) "agreed to the request of ICAO to extend the use of GRIB 1 for the user of aviation products up to November 2010, because necessary equipment and software for GRIB2 will not be available in all countries by November 2008" (general summary 6.2.64, abridged final report of CBS-Ext.(06)).

The meeting agreed that GRIB edition 1 was to be separated from the Manual on Codes in consideration of no aviation requirements, which was confirmed by the ICAO representative, recognizing that the separation meant no allowance of GRIB1 for reporting only.

The agreement by the meeting will be forwarded to the next CBS session in 2016. If the separation is agreed by the CBS session, the edition 1 will be made available from the WMO Web site along with the previous editions of FM 94 BUFR and FM 95 CREX.

# 8.3 B/C regulations in multiple languages[⮉](#Cont_8)

The *Regulations for reporting traditional observation data in TDCF: BUFR or CREX* were introduced on 7 November 2007 in the section d, Part C of the Manual on Codes, Volume I.2 (WMO-No. 306) in accordance with the Recommendation 6 of the CBS Extraordinary Session in 2006 (Rec. 6 (CBS-Ext.(06))) below, only English texts of which have been available on the WMO Web site.

***Recommends*** *that the following amendments be adopted for operational use as from 7 November 2007:*

*(1) Addition in the Manual on Codes, Volume, I.2, Part C, Common Features to Binary and Alphanumeric Codes, of chapter: “d. Regulations for reporting traditional observations data in Table Driven Code Forms: BUFR or CREX” defined in the Annex to this recommendation;*

***Requests*** *the Secretary-General to arrange for the inclusion of these amendments in the Manual on Codes, but to be kept only in the WMO Web server.*

In order to facilitate the Migration to Table-Driven Code Forms (MTDCF), the regulations should preferably be made available in four languages, i.e. English, French, Russian and Spanish in the same manner as the other sections of the Manual.

From practical viewpoint, a problem has been identified in translating a list of amendments to the B/C regulations. The list of amendments for adoption between CBS sessions, which usually conveys amendments to B/C regulations, must be translated into other three languages to be posted to the Permanent Representatives who use the corresponding languages. However, the French, Russian and Spanish speaking people do not have reference texts to be amended on the web.

Moreover, unavailability of the reference texts possibly results in the situation that the same English texts are translated differently from time to time.

In view of the above history and situation, the meeting agreed the B/C regulations should be made available also in other three languages, i.e. French, Russian and Spanish, and requested the Secretariat to take necessary actions for making it available from the web.

# 9. WMO STANDARD DATA DESIGNATORS

 (see the relevant discussion on Item [3.2.14](#S2015_3_2_14))

# 10. TASK TEAMS IN IPET-DRMM

# 10.1 Overview and work plan of task teams in IPET-DRMM[⮉](#Cont_10)

The fifteenth session of the Commission for Basic Systems (CBS-XV) (Jakarta, Indonesia, 10–15 September 2012) agreed that task teams could be established between CBS sessions.

*5.2.3 The Commission also agreed that task teams may be established, as required, within each of the OPAGs to address specific tasks included in its work plan. These task teams could include experts in any of the CBS expert teams. Between sessions, OPAG chairs can propose the formation and terms of reference of these teams for the president to endorse.*

In accordance with the agreement, the Task Team on GRIB (TT-GRIB), the Task Team on BUFR (TT-BUFR) and the Task Team on Data Standards Monitoring (TT-DSM) were established. The Task Team on Aviation Coding Issues (TT-AvCI) was established later in February 2015 to further the collaborative work with ICAO on aviation coding issue. The membership and terms of reference are shown on the WMO Web site at;

 <http://www.wmo.int/pages/prog/www/CBS/Lists_WorkGroups/CBS/opag%20iss>

[TT-GRIB and TT-BUFR]

The Lead of TT-GRIB, Dr Enrico Fucile and de facto Lead of TT-BUFR, Mr Yves Pelletier, in association with the IPET-DRMM members, have collected and evaluated the requirements for the new editions of GRIB, BUFR and CREX (consequently), whose recent achievements were reported at the relevant agenda item (Item 2.3 and 3.3), respectively.

The meeting separated into two subgroups for discussing pending issues at this meeting and outline plan for developing the new editions. The plenary meeting concluded that new editions of GRIB and BUFR, and if needed CREX, will be developed in the coming year with a view to submit them to the next meeting of IPET-DRMM and then to the next CBS session in 2016.

[TT-AvCI]

Productive discussions have been made actively between the Lead of TT-AvCI, Mr Yves Pelletier and the Secretariats of WMO and ICAO to confirm the current status and future development of the Amendment 77, which implementation is scheduled for November 2016.

The meeting thanked, Mr Yves Pelletier, the Lead of TT-AvCI, for his actions taken for drafting the amendments to the aeronautical codes in the Manual on Codes (WMO-No. 306) in collaboration with Mr Halsey, ICAO Secretariat, which was dealt with separately in the item 6.1.

The meeting discussed the best approach for synchronized implementation of the amendments to the aeronautical codes, keeping below in mind;

a) The ICAO Air Navigation Commission (ANC) will review the Amendment 77 from technical viewpoint in October 2015.

b) The ICAO Council will approve it in March 2016, which is the final decision by ICAO.

c) Other information to be provided by ICAO in the item 6.1.

d) No further face-to-face meeting of IPET-DRMM will be anticipated for approval of the amendments.

Mr Pelletier was of the opinion that if significant changes were made to the current proposal it should be discussed at the next face-to-face meeting of IPET-DRMM with the delayed implementation date, which seemed agreeable by ICAO as stated by Mr Halsey.

# 11. COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES

# 11.1 TT-DSM and the future involvement in the WIGOS Monitoring[⮉](#Cont_11)

WMO has been developing the WIGOS Data Quality Monitoring System (WDQMS) under the direction of the EC Inter-Commission Coordination Group on the WMO Integrated Global Observing System (ICG-WIGOS) and its task teams in cooperation with CBS and other WMO Technical Commissions. It is still conceptual, although some structure and functional architecture of WDQMS have been drafted. It is expected to perform a function to identify erroneous BUFR messages as one of its functions.

In view of the special expertise required to understand and handle the issues, the TT-DSM as a special component of IPET-DRMM may effectively be involved in the system.

As expressed at the item 7, some national and global NWP centres are identifying issues with various BUFR message types arising from the migration to TDCF. These are summarised as:

a) Members are not providing clear and adequate notification of their transition from alpha-numeric formats to TDCF.

b) Members are not clear on what process should be undertaken in the testing and validation of new code formats.

c) Data users are not being adequately informed regarding changes to message formats.

d) Feedback and communications mechanisms between data users and data providers for reporting of coding changes and issues are inadequate.

In view of the difficult situation posed by the migration to TDCF, the WMO Secretariat has been providing a forum for NWP Observations Data Quality Issues that is identifying issues encountered by NWP centres. ECMWF also has established an online forum for reporting and discussion of issues relating to transition to BUFR.

The meeting discussed the possible involvement of the Task Team on Data Standards Monitoring (TT-DSM) in the WIGOS Monitoring System as a consultative body to provide expertise on BUFR coding, noting the progress of WIGOS Monitoring System development and also in the recent rather pragmatic initiatives of the forum to identify and correct erroneous BUFR messages.

The meeting and the Lead of TT-DSM, Mr Jose Mauro de Rezende agreed that the TT is to be involved in the WDQMS, when it is established, as a consultative body on BUFR coding issues and also in the initiative of the forum to correct erroneous BUFR messages effectively. It was concurred that the WMO Secretariat will assist the TT's involvement.

# 11.2 New decoding software for WMO Community[⮉](#Cont_11)

Dr Enrico Fucile, ECMWF, made a presentation on the new software *ecCodes* for BUFR and GRIB, which has been developed with the aim to provide a unique user friendly library to access data in both formats. The *ecCodes* is an evolution of GRIB-API decoding engine and is able to decode and encode GRIB and to decode BUFR. Dr Fucile mentioned BUFR encoding is under development and will be available soon (by the end of this year). A beta version of the library is freely available for download from ECMWF software web site below and is released under Apache 2.0 license.

 [https://software.ecmwf.int/wiki/display/ECC/ecCodes+Home](https://software.ecmwf.int/wiki/display/ECC/ecCodes%2BHome)

Dr Fucile explained the *ecCodes* is a general purpose decoder for binary and text messages based on a key/value approach, which has been successfully used in GRIB-API for GRIB decoding/ encoding and is being appreciated by the early users of *ecCodes* also for BUFR decoding. He added that to provide key/value access to BUFR it has been necessary to establish a vocabulary of key names associated with the BUFR table B elements and semantics for context dependent meaning of the information items.

Dr Fucile emphasized the key value approach is very convenient for users and makes *ecCodes* very useful for the development of the new BUFR and GRIB editions, given the requirements of harmonisation with the ISO standards which are well applied in the XML context.

Dr Fucile expressed that ECMWF keep producing tables for the current GRIB-API.

The meeting noted the advantages of the *ecCodes* and thanked Dr Fucile and ECMWF for the continuing contribution to the WMO community.

# 11.3 New BUFR web checker for WMO Community[⮉](#Cont_11)

For years ECMWF has been providing a web BUFR checker, accessible from the ECMWF web site to the WMO Community to support the migration from TAC to BUFR and to help the development of new BUFR templates.

Dr Enrico Fucile, ECMWF, notified that ECMWF was in the process of migrating from the old web site, which is now accessible at [old.ecmwf.int](http://old.ecmwf.int), to the new [www.ecmwf.int](http://www.ecmwf.int). In the context of the migration a review of all the web applications has been performed and the web BUFR checker has been re-engineered and will be made available on the new web site for the benefit of WMO Community.

Dr Fucile emphasized that the new web BUFR checker was based on new web technologies and JSON (http://json.org) format to be integrated in the new web site architecture. *ecCodes* has been used to develop the new web checker which is not linked to the old BUFRDC decoding library. He invited the meeting to test the application and send feedback to software.support@ecmwf.int.

It was confirmed that the link of the web checker on WMO web site should be the old one.

The meeting recognized the efforts by ECMWF for the benefit of WMO Members' migration to TDCF and thanked Dr Fucile for his leading role in the development.

# 11.4 Membership of CBS-MG task team on resolving the TDCF radiosonde issue[⮉](#Cont_11) [Annex](file:///C%3A%5CWORKPLACE%5CMEETING%5CIPET-DRMM%5CIPET-DRMM-III_Beijing2015%5CReport%5CReport_IPET-DRMM-III_Beijing_annex.docx#A2015_11_4)

CBS Management Group decided at the meeting on 2 June 2015 that a task-specific team was needed to assist IPET-DRMM resolve the problem of representing upper-air information in BUFR in a way that met the needs of the NWP community.

Subsequently, the members of the CBS management group have agreed the following terms of reference for the team:

a) Assist IPET-DRMM to identify and implement a solution for handling upper air reports that assures the continuing availability of reports from observing sites, and the ability of NWP centres to process the reports, so that the introduction of TDCF upper air reports does not degrade the NW forecasts, and in particular:

- to summarize general issues related to BUFR and requests on how to promote TDCF migration from the viewpoint of NWP centres and report them to IPET-DRMM;

- to advise IPET-DRMM on a method by which NWP centres report every issue they find in BUFR messages;

- to advise to IPET-DRMM on the role of NWP centres in the process for checking the quality of BUFR messages.

b) Assess the additional costs to user centres of maintaining their systems to process upper air observations continuing to be being sent in TAC, and assess the costs of accelerating migration of observing systems to produce information in correctly formatted BUFR.

c) Summarize the benefits of using TDCF in preference to TAC from the perspective of NWP centres.

The meeting recognized the importance of involvement of NWP centres to incorporate in the migration to TDCF from users' perspective, but noted that benefits of using TDCF in preference to TAC (the task c above) has been summarized many times clearly at training courses and seminars.

It was suggested that climate community also is interested in this activity and data providers should be involved. The meeting then discussed the membership of the team. Some members of IPET-DRMM were nominated to the team as shown in the Annex to this paragraph and others will be done offline.

# 11.5 Moving Plotting Symbols to the Manual on Codes[⮉](#Cont_11)

Manual on the Data-Processing and Forecasting Systems (GDPFS), Volume I (WMO-No. 485) is under a major revision and in this process each part of the Manual is reviewed from the viewpoint of the relevance to Members’ activities.

In the discussion of the CBS Task Team on the revision of the Manual on GDPFS, the Appendix II-4 Graphical Representation of Data, Analyses and Forecasts, which defines plotting symbols mainly used in weather charts, was confirmed to be still relevant to WMO Members’ activities, including those of Regional Specialized Meteorological Centres (RSMCs), and concluded that it would be kept in Technical Regulations. At the same time, it was pointed out that the Manual on GDPFS might not be the appropriate place to have the definitions, because the part is better placed in documentations related to data representation.

The Implementation Coordination Team on Information System and Services (ICT-ISS) held in February 2015 agreed that the WMO plotting symbols fell within the scope of the Manual on Codes, and while recognizing that IPET-DRMM may not currently have members with the relevant skills, it asked IPET-DRMM to take responsibility for them.

The meeting considered this issue in view of advancing a proposal for including the part in Manual on Codes at the 16th session of CBS to be held in 2016, where the draft of revised Manual on GDPFS is planned to be approved.

The meeting was informed it was a reason that the revised Manual on GDPFS will more focus on process of forecasts on numerical weather predictions.

The meeting felt there was no expertise in the team, while there was requirement neither to change and nor to actively develop the symbols, however, there was still a concern on potential changes.

The meeting recognized that there was actually a request to move the plotting symbols from the Manual on the GDPFS to the Manual on Codes and this was not an issue of resource, because it had been done and would be done as well.

The meeting closed the discussion as there was no unanimous support but a consensus was this needed to be done.

# 12. CLOSURE OF THE MEETING

The meeting was closed at 17:15 on Friday 24 July 2015.

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

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

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

(BEIJING, CHINA, 20 - 24 JULY 2015)

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