**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR BASIC SYSTEMS**

**FIRST MEETING OF**

**THE INTER-PROGRAMME EXPERT TEAM ON CODES MAINTENANCE**

**FINAL REPORT**

**GENEVA, SWITZERLAND, 24−28 JULY 2017**

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**Executive Summary**

The first meeting of the Inter-Programme Expert Team on Codes Maintenance (IPET-CM) took place at the WMO Headquarters in Geneva, Switzerland from 24 to 28 July 2017.

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

– Introduction of Common Code table C–0 (GRIB, BUFR and CREX master table version number) and associated amendments,

 and amendments to

– B/C Regulations for SHIP data in BUFR resulting from the changes to VOS categories,

– B/C Regulations to enhance snow depth reporting in compliance with the amendments to Manual on the GOS (WMO-No. 544) (Res. 15 (EC-69)),

– GRIB2 Code table 4.2 (Parameter number) for precipitation, rip current, snow cover, visibility and freezing level,

– BUFR/CREX Tables for GPM precipitation, FY-3 VASS, offshore platforms and satellite-derived winds, and

– Common code tables for identification of centres and sub-centres, satellite and instrument identifiers, radiosonde descent, and identifiers for water temperature profile instruments.

The meeting reviewed several proposals to the experimental version of GRIB edition 3 (Decision 6 (CBS-16)). These proposals will be validated for inclusion in the experimental GRIB edition 3, reflecting comments and suggestions during the meeting as appropriate.

The meeting discussed the establishment of task teams within IPET-CM to deal with specific issues, which the meeting agreed should be achievable deliverables. It agreed four task teams to establish, which will be formalized by the chair of OPAG-ISS (to propose) and the president of CBS (to endorse).

The meeting reviewed the status of migration to TDCF derived from WWW Monitoring Exercise and regional initiatives. It was noticed still more efforts are required for the migration of surface data (in some regions) and upper-air data (as a whole). Some Members states reported high-resolution upper-air BUFR messages became available, which is one of the advantages of BUFR form.

The meeting reviewed the report from the CBS MG/Task Team on Upper-Air BUFR (TT-UABUFR) on systematic errors in upper-air BUFR reports, which should be treated as a pilot project for the WDQMS and for which GISCs will play the role of WIGOS Regional Centres. It agreed to collaborate with WIGOS to deal with this issue.

The meeting discussed the concerns over migration to WIGOS Identifiers expressed by user community, especially by NWP centres. It agreed that data producers should not underestimate the impact of introduction of WIGOS Identifiers, because the current system of station identification has the potential to impact all systems tasked with the processing and storage of observational data. The meeting concluded that a letter to remind Members of technical details in reporting WIGOS Identifiers in BUFR/CREX format would be more appropriate than amending B/C Regulations, which took too long.

The meeting noted with interest the security concern on processing XML files, which is required in association with introduction of IWXXM (ICAO Meteorological Information Exchange Model) being ICAO Standard. It agreed to share the important information within organizations of the participants and other technical bodies, such as HMEI and ET-WISC and TT-AvXML within CBS.

The meeting noted the progress made for WMO code registry and agreed to consider its contribution when the scope of work and its regulatory status is clarified, in relation to the existing Manual on Codes and its machine-readable tables.

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**FIRST MEETING OF
THE INTER-PROGRAMME EXPERT TEAM ON CODES MAINTENANCE**

**(GENEVA, SWITZERLAND, 24−28 JULY 2017)**

# 1. ORGANIZATION OF THE MEETING

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

The first meeting of the Inter-Programme Expert Team on Codes Maintenance (IPET-CM) took place at the Headquarters of WMO in Geneva, Switzerland from 24 to 28 July 2017.

Ms Jitsuko Hasegawa, chairperson of IPET-CM, expressed appreciation to the participants, who have contributed to the team, and also new members for their participation during the summer time season. Ms Hasegawa was sure that the team will work effectively and productively with well-established working arrangements, including annual face-to-face meeting, and through twice-a-year fast-track amendments to the Manual on Codes.

Ms Hasegawa suggested time to pay tribute to the Mr Alexander Kats who has greatly contributed to the team and passed away on 22 May 2017. Ms Hasegawa introduced great contributions by Mr Kats, such as to migration to TDCF at global level, to enhancement and modernization of upper-air observations and to the base of OSCAR surface on radiosondes.

Mr Peiliang Shi, Director of the WMO Information System Branch, OBS Department of WMO, expressed, on behalf of the Secretary-General of WMO, deep sorrow for the passing away of Mr Alexander Kats, who has very actively contributed not only to this team but also to CBS and CIMO. Mr Shi hoped Mr Kats rests in peace and is remembered by all of us in the WMO community.

The meeting observed one-minute of silence for Mr Kats, which was led by the co-chair of IPET-CM, Mr Yves Pelletier.

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

The meeting agreed on the agenda, which is in the [**Annex**](#A2017_1_2) to this paragraph along with the list of participants.

# 1.3 Working arrangement[⮉](#Cont_1)

Ms Jitsuko Hasegawa presented the working plan to the participants. Ms Hasegawa emphasized considerable time is assigned to the issue of GRIB edition 3. The meeting agreed with the working plan.

# 2. MANUAL ON CODES: TABLE-DRIVEN CODE FORMS

# 2.1 Amendments to GRIB regulations

### 2.1.1 New GRIB2 Code Table 4.2 entries

# 2.2 Additions to GRIB templates and tables

### 2.2.1 New GRIB2 Code table 4.2 entries[⮉](#Cont_2_2)

The Global Precipitation Measurement (GPM) mission is an international network of satellites providing worldwide rain and snow observations every three hours. It was jointly initiated by the U.S. National Aeronautics and Space Administration (NASA) and the Japan Aerospace Exploration Agency (JAXA) and includes a consortium of other international space agencies as well.

Mr Jeffrey Ator, [National Oceanic and Atmospheric Administration](http://www.noaa.gov/) (NOAA)/National Weather Service (NWS), proposed new GRIB edition 2 (GRIB2) parameters requested by NASA for use in precipitation products together with a new parameter requested by the U.S. National Centers for Environmental Prediction (NCEP) for use in output from an oceanographic model.

It was recalled that entry names associated with quality control and statistical process has been avoided, so the approach will be used for the two proposed parameters in Code table 4.2. The other two are approved for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_2_1) to this paragraph.

### 2.2.2 New GRIB Code Table 4.2 entry[⮉](#Cont_2_2)

In analogy with other fraction covers like “fraction of cloud cover”, “fraction of convective precipitation”, Dr Enrico Fucile, European Centre for Medium-Range Weather Forecasts (ECMWF), proposed an entry “fraction of snow cover” in Code table 4.2, which is the fraction of cell or grid box covered by snow.

The meeting agreed the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_2_2) to this paragraph.

### 2.2.3 New GRIB2 Code table 4.2 entries[⮉](#Cont_2_2)

Canadian Centre for Meteorological and Environmental Prediction (CCMEP) is implementing new post-processing diagnostics and Nowcasting forecasts.

Mr Yves Pelletier, Meteorological Service of Canada (MSC), proposed entries in GRIB Code table 4.2, which Mr Pelletier hoped were sufficiently general for eventual use by other centres.

The proposed parameters for visibility were accepted. The proposed parameters for categorical convective precipitation was accepted with the use of Code table 4.222. The remainder will be revised and resubmitted.

It was pointed that three parameters with asterisks in the initial proposal should be "Code tables", not "Numeric".

With regard to the proposal, Mr Pelletier asked the team on use of "probability" and whether parameters in hydrology discipline might be used in general meteorology product.

The meeting recalled in view of the past discussions that the discipline specified in section 0 requires use of parameters from the aforementioned discipline. Therefore it is permissible to define similar parameters in different discipline.

The meeting agreed the proposal with some correction on code tables for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_2_3) to this paragraph.

# 2.3 Amendments to BUFR/CREX regulations

# 2.4 Additions to BUFR/CREX tables

# 2.4.1 New BUFR entries for GPM precipitation data[⮉](#Cont_2_4)

In relation to 2.2.1 above, Mr Jeffrey Ator, NOAA/NWS, presented a proposal on a new entry in BUFR Table D together with relevant Code and Common Code tables entries for use in precipitation products by the GPM mission.

Mr Ator informed these entries have been reviewed by the CGMS Task Team on Satellite Data in mid-April 2017, i.e. no objections.

Ms Fang Zhao, China Meteorological Administration (CMA), informed there was Code table 0 13 040 (surface flag), which is not in coordinate classes. The meeting preferred the table in non-coordinate class.

The meeting agreed the proposal with changes, including above, which were validated during the week between USA and EUMETSAT, for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_4_1) to this paragraph.

# 2.4.2 New BUFR entries for radiosonde descent data[⮉](#Cont_2_4)

# 3.1.1 Regulations for radiosonde descent data[⮉](#Cont_3_1)

Several Member states are changing over to the new radiosonde Vaisala RS41 and sounding system MW41, which offers the functionality to provide radiosonde descent data.

A few Members, such as Deutscher Wetterdienst (DWD) and Finnish Meteorological Institute (FMI) started to exchange these descent data from their radiosonde stations internationally, which provide additional information of the atmosphere without large financial impact for data providers and data users and proved positive impact to NWP.

Ms Sibylle Krebber, DWD, reported that TM309053 seems unsuitable for radiosonde descent data reporting, because users would like to know at which radiosonde station the sounding was launched and whether the sounding equipment carried a parachute in view of significant impact of drop speed. It has been noticed that data users will treat ascent and descent data separately for duplicate checking, monitoring and blacklisting.

Accordingly, Ms Krebber proposed a new sequence 3 09 056 in BUFR Table D and new sub-categories in Common Code table C-13, requesting Issuer of Identifier of WIGOS Station Identifier to link the radiosonde descent data to the launching radiosonde station.

It was questioned that one single sequence will be introduced with B/C Regulations for radiosonde descent data. Ms Krebber agreed this was only a proposal for discussion. Nevertheless, she believed it is good to have one sequence for descent data as standard sequence.

The meeting approved the new C-13 entries for adoption by FT2017-2 as in the [annex to 2.4.2](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_4_2) and [annex to 3.1.1](Report_IPET-CM-I_Geneva_annex.docx%22%20%5Cl%20%22A2017_3_1_1) and the sequence for validation with necessary corrections, reflecting the discussion summarized below. Once the sequence is validated, associated amendments of B/C Regulations will be proposed.

The meeting:

a) was notified that 'issuer of identifier' cannot be used for distinguishing descent data from ascent data.

b) agreed that the team aims at developing a single standard format for descent data.

c) noted issues to be addressed in the proposed template

i) how to distinguish descent data from ascent data, making sure a firm link between ascent and descent data from a radiosonde; data subcategory in section 1 is enough or not.

ii) the definition of 3 01 113 (date/time of launch) and 3 01 021 0 07 007 (lat/lon, height) should be clarified to make it clear that they are time and location of balloon burst.

iii) the template can be a general format for simple drift data both for ascent and descent data.

iv) NWP users might prefer one single pack of all the drift data both for ascent and descent from a radiosonde.

v) there is a view that quality information at each level is necessary for descent data because data quality is inconsistent.

d) noted the contributors to the further development of the template: DWD, CPTEC, Met Office, ECMWF, JMA

There is an open question whether traditional location identifier should be included in the template in addition to WIGOS identifier sequence, because WIGOS identifiers can be assigned with no association with its traditional 5-digit identifier and data users might have difficulties in using quality information associated with the observation site. The team agreed to consult this issue with NWP community.

# 2.4.3 New BUFR entries for FY-3 VASS Products[⮉](#Cont_2_4)

The VASS (Vertical Atmospheric Sounding System) is a sounding instrument package loaded on FY-3 (A, B, C) satellite series. It is composed of the MicroWave Temperature Sounder (MWTS), the MicroWave Humidity Sounder (MWHS) and the InfraRed Atmospheric Sounder (IRAS). The VASS products mainly contain channel brightness temperature, ocean wind, emissivity, cloud liquid water, surface type and temperature, etc., which can be applied in the NWP model and satellite data assimilation, the climate model study and the atmospheric vertical sounding research.

Ms Fang Zhao, CMA, proposed several new sequences in Table D, new descriptors in Table B and corresponding code table entries together with a new sub-category in Common Code table C-13 to disseminate VASS products of FY-3 in BUFR on GTS.

The meeting approved the new C-13 entry, the code table entries for 0 13 040 and the amendments for the element name for three table B descriptors for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx%22%20%5Cl%20%22A2017_2_4_3) to this paragraph and the sequences for validation.

### 2.4.4 BUFR template for surface observations from n-minute period[⮉](#Cont_2_4)

The WIGOS Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) outlines key activities to be undertaken during the period 2012 to 2025 aiming at maintaining and developing all WMO component-observing systems. According to EGOS-IP, many surface-based observing systems could be made more efficient by processing and exchanging all hourly data globally.

EUMETNET Members expressed their interest in the international exchange of sub-hourly AWS data because an increase of the number of observations in space and time is considered to be essential to fulfil the emerging needs of kilometre-scale NWP models as well as of climate, forecasting and aviation meteorology.

In order to fulfil the requirements from EUMETNET, Ms Sibylle Krebber, DWD, proposed revision to the BUFR template for n-minute AWS data (TM307092) at validation stage.

The meeting reviewed the proposed changes to the validation entries and agreed for further validation (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_4_4)).

The team discussed whether details of all metadata should be included in the template or relied only on the use of OSCAR database, and request the validation group to discuss and report back to the team.

### 2.4.5 New BUFR sequence for describing satellites contributing to an observed geophysical quantity[⮉](#Cont_2_4)

Several satellite products (e.g. atmospheric motion vectors, AMVs) are produced by fusing data from multi-satellite constellations. Currently the constellation can be described to users by using special combinatorial entries in Common Code table C-5 to describe multiple satellites.

Some applications, however, would profit from receiving not only a summary of the identities of the contributing satellites, but also the specific satellites involved (i.e. Metop-1, -2 and -1 for a triplet constellation, rather than a generic mix of Metop satellites).

As the reference image has the largest contribution to the quality of a given product, the platform on which it was collected can be of relevance, especially as some satellites have long mission lifetimes and thus be subject to sensor degradation for longer periods of time.

Dr Simon Elliott, European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), presented a proposal of a sequence in BUFR Table D to meet above requirements.

The meeting agreed it for validation as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_4_5) to this paragraph.

# 2.5 Additions to Common Code tables

# 2.5.1 New Common Code table C-12 entries for CIMSS[⮉](#Cont_2_5)

The U.S. Cooperative Institute for Meteorological Satellite Studies (CIMSS) is listed in Common Code tables C-1 and C-11 as originating centre #176. Several sub-centres have already been defined in Common Code table C-12 for CIMSS.

Mr Jeffrey Ator, NOAA/NWS, presented a proposal on new sub-centres of CIMSS, understanding it is non-controversial due to entries within assigned range for CIMSS.

The meeting agreed without changes the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_1) to this paragraph.

# 2.5.2 New Common Code table entries for Spire Global, Inc.[⮉](#Cont_2_5)

Spire Global, Inc. (<https://spire.com>), a U.S. corporation operating a fleet of nanosatellites for commercial purposes, will be participating in a pilot demonstration program to provide radio occultation data to NOAA for evaluation.

The data will be reported in the standard BUFR sequence descriptor 3 10 026, but during the evaluation period currently scheduled to begin in November 2017, the data will only be available for non-operational use (e.g. research and verification) in delayed mode of at least 24 hours, rather than in real-time. Other non-commercial organizations including other global NWP centers may also be granted access to the data in delayed mode through NOAA, upon request. The evaluation period is expected to conclude in mid-2018.

The Spire fleet consists of 40+ different nanosatellites which will likely increase in the future, and there will be up to 4 different receiver configurations at any given point in time which are described in the proposal.

Mr Jeffrey Ator, NOAA/NWS, proposed new entries in Common Code tables C-1, C-11, C-5 and C-8, which are required to identify the satellites and instruments and have been reviewed and approved by the CGMS Task Team on Satellite Data.

The meeting agreed the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_2) to this paragraph.

# 2.5.3 New entries in Common Code tables C-5 and C-8 by India[⮉](#Cont_2_5)

Indian Space Research Organization (ISRO) has successfully launched INSAT-3DR (INSAT-3D Repeat) satellite on 9 September 2016, which has been positioned at 74 degrees east. Kalpna-1 has been shifted to 73.2 degrees east, accordingly.

ISRO has started receiving data from INSAT-3DR from 15 September 2016 and is carrying out initial calibrations and validation exercise.

Identifiers for INSAT-3DR and its instrument and INSAT-3DS (INSAT-3D Spare) in advance, which are required for wind data transmission on GTS, are requested by the focal point for codes and data representation matters of India, Mr Sankar NATH.

The meeting agreed the proposed entries for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_3) to this paragraph.

### 2.5.4 Common Code table for master table version numbers of GRIB, BUFR and CREX[⮉](#Cont_2_5)

FM 92 GRIB, FM 94 BUFR and FM 95 CREX are table-driven code forms (TDCF), to which original data are converted and from which original data are derived through relevant TDCF tables. GRIB has Code table 1.0 to specify the master table version numbers, however, the version numbers of BUFR master table 0 are specified in Note 5 to Section 1 of the Specifications of Octet Contents of BUFR and similarly for CREX. Since these are not exactly TDCF tables, the full benefit of "table-driven" has not been utilized.

In view of above, Common Code table C-0 was proposed to combine lists of master table version numbers of GRIB, BUFR and CREX and to connect the version numbers with master table 0 for BUFR/CREX.

In GRIB, there was a consensus that disciplines in GRIB Code table 0.0 are to be connected to each parameter and not to master tables to be maintained by communities, which is different from BUFR/CREX.

The meeting agreed the new Common Code table C-0 and amendments to Specifications of Octets of BUFR/CREX and GRIB with adjustments consequential from above discussion for adoption by ABC2018 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_4) to this paragraph, understanding WMO Members and other TDCF users could practically deal with the version numbers the same as before until their software becomes capable of referring to the common code table.

### 2.5.5 New entries to Common Code table C-3/BUFR Table 0 22 067 for Argo floats[⮉](#Cont_2_5)

Dr David Berry, the representative from Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM), proposed entries for new types of Argo floats, which is an update of previous proposal with changes to some of code figures.

The meeting agreed the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_5) to this paragraph.

### 2.5.6 New Common Code table entries in C-5 and C-8 for FY-4A[⮉](#Cont_2_5)

FY-4 is a new geostationary meteorological satellite series of China planned to cover the duration of 2016~2020, the first satellite of which, FY-4A, was launched on 11 Dec. 2016.

Four new instruments are on board. They are the Advanced Geosynchronous Radiation Imager (AGRI), the Geosynchronous Interferometric Infrared Sounder (GIIRS), the Lightning Mapping Imager (LMI) and the Space Environment Package (SEP). The Atmospheric Motion Vector product of FY-4A will be disseminated in BUFR at this stage.

Ms Fang Zhao, CMA, proposed new entries in Common Code tables C-5 and C-8 to identify FY-4A and the instruments loaded. EUMETSAT suggested a new entry in 0 02 020 to identify FY4, which was adopted.

The meeting agreed the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_6) to this paragraph.

### 2.5.7 New entry in Common Code table C-5 to include satellite identifier for Sentinel 3B[⮉](#Cont_2_5)

The launch of Sentinel 3B is planned for Q4 2017. Dr Simon Elliott, EUMETSAT, proposed a satellite identifier in Common Code table C-5 so that data collected from this satellite can be disseminated after commissioning in BUFR.

The meeting agreed the proposal for adoption by FT2017-2 as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_5_7) to this paragraph.

# 2.6 GRIB edition 3, including work plan of TT-GRIB[⮉](#Cont_2_6)

Dr Enrico Fucile, Lead of TT-GRIB, presented proposals on GRIB edition 3 (GRIB3), as summarized below and in the annex to this paragraph. The meeting did not request any fundamental changes in its approach and structure. To the best of the team's knowledge, the structure conforms to the WMO Logical Data Model.

The meeting agreed to start validation process based on the proposals and requested the lead of TT-GRIB to report back the results, especially about

- the functionality to refer externally defined resources,

- the approach to be taken for representing statistical processes in relation to the parameter definitions.

The meeting agreed to the schedule for next steps:

- by the team meeting in 2018, TT-GRIB will consolidate templates and parameter tables, produce sample data sets and hopefully prepare another decoding software application besides that of ECMWF,

- the final proposal will be made to the responsible technical commission session planned to be held in 2020, which would be approved by the EC to be held the year after.

The meeting identified several items to be discussed and agreed in the process of finalizing the proposal, including:

- criteria for making the new edition operational, especially the requirements for software applications to encode and decode GRIB3 files.

- how to communicate the status of GRIB2 after the introduction of edition 3; at the moment, the team looks at a similar approach that was taken for the migration from edition 1 to 2, i.e. the phased approach of stopping regulation changes and addition of new features as the first step and stopping addition of templates and parameters as the second step.

- how to communicate selling points of GRIB3 to motivate WMO Members and other WMO communities to start using the new edition and eventually fully migrate from edition 2.

- amendments in regulations that are necessary according to the introduction of edition 3.

- how to improve understanding of strengths and benefits of GRIB3, especially from the user's point of view, in order to speed up its uptake.

Following are the individual proposals, which Dr Enrico Fucile, ECMWF, presented to the meeting and invited the meeting to agree with overall structure and concept. Details will be reviewed during validation process.

# 2.6.1 Templates and Template components for time intervals[⮉](#Cont_2_6)

In the process of defining new template components, the definition of time statistical process and time interval are important. However, it is not clear in GRIB2 if a statistical process changes the units of the parameter and its interpretation was left to users after the application of a statistical process.

ECMWF assumes that a statistical process could change the units of the original parameter or the parameter can be the final product after the application of the time statistical process. The Code table 3.5 was proposed to explicitly express the change of units by statistical processing.

The proposed template builds the nested application of a time statistical process by repeating the “forecast time interval” component several times explicitly.

Some concerns or questions were expressed on references by byte number, impact to templates by a template component change and negative time from reference time.

It was understood that the reference by byte number, such as "defined by byte 5" would be a better approach but may need a clear definition. The impact to templates by a component change could basically be manged by master table version number, but it would need a clear regulation. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_1))

# 2.6.2 Parameters table[⮉](#Cont_2_6)

In the parameters table for experimental GRIB3, several parameters from the corresponding table of GRIB2 were not included, because there was not a clear knowledge on how the time statistics was going to be developed. If the proposed time interval (see 2.6.1) is accepted most of the deprecated parameters can be re-introduced. The aim is to have a table as close as possible to GRIB2 table for compatibility reasons, but excluding deprecated entries.

It was emphasized in this relation the proposed table is the first draft, which needs careful review, and a suggestion what can be done.

In the proposal, elements derived from time statistical process were deleted, such as maximum temperature and minimum temperature. There were specific cases, such as total column integrated cloud water, cloud water, total precipitation and total precipitation rate, which are to satisfy different requirements from different people.

There were two perspectives, i.e. NWP and observations. The former prefers a basic rule to introduce simple parameters separated from not only time statistical process but also vertical and horizontal processes but the latter requires some composite parameters to observe, such as column integrated parameters.

In relation to above, a possible approach was suggested, which is to delete parameters as much as possible and to introduce, when needed, with careful review. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_2))

# 2.6.3 Amendments to current version of GRIB edition 3[⮉](#Cont_2_6)

Some editorial changes were proposed to correct some incorrect section and code table entries in the experimental GRIB3.

The meeting accepted the changes to be reflected in the experimental GRIB edition 3 for further validation. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_3))

# 2.6.4 Template for Gaussian and other grids[⮉](#Cont_2_6)

Horizontal Domain Templates (HDTs) and an HDT component (HDTC) were proposed to provide a flexible way to describe a grid, which are to meet the requirements from increased resolution and complexity of grids and more precise description of grid points.

In the proposed set of grids, latitudes are separated from longitudes. Since in this approach all grid types cannot be described, more generic grids or meshes are considered in a different set of templates.

The meeting noticed adjustments are required in the proposal, such as to byte numbers and naming of contents, such as "rank" to "index". It was also encouraged to develop other grid template components, such as space view grid components. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_4))

# 2.6.5 Template for unstructured mesh[⮉](#Cont_2_6)

# 2.6.9 Template for irregular grid[⮉](#Cont_2_6)

HDTs and an HDTC were proposed for unstructured mesh (grid), in which a list of latitudes and longitudes are encoded by the simple packing algorithm. The mesh proposed is completely unstructured and it was stated that some work was needed to provide extra components to define connectivity of the grid and to define partially structured grid.

In addition to the unstructured mesh (grid), there is also the need of defining a bi-dimensional grid with a couple (latitude, longitude) values associated with a couple of integer coordinates on the grid (i, j).

In terms of arrays, the unstructured mesh can be defined as (latitude(k), longitude(k)) with k = 1,…,NumberOfPoints, and the irregular grid can be defined as (latitude(i,j), longitude(j,j)) with i = 1,…,Ni and j = 1,…,Nj.

Differences between the proposed HDTCs 4.13 and 4.14 are in the first four bytes, i.e. number of grid points (HDTC4.13) and Number of columns and rows (HDTC4.14).

The concept was concurred but the meeting invited to develop further the proposals, computing number of bytes. It was noticed "mesh" in the name was also a subject. (see [annex to 2.6.5](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_5) and [annex to 2.6.9](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_9))

# 2.6.6 Horizontal domain URL[⮉](#Cont_2_6)

A mechanism was proposed to refer to externally defined templates by providing a Uniform Resource Locator (URL) to omit the grid description in GRIB messages.

This is a special URI (Uniform Resource Identifier), which in addition to being a unique identifier, is also providing location and retrieval mechanism for the sample GRIB providing the missing template. The URL section will replace any of the horizontal domain sections and the decoding software has to be able to locate a GRIB pointed by the URL and to get the horizontal domain section from it to replace the URL template which is only a place holder and a pointer.

There was a consensus that URL should be represented in a single string and have notes to explain how to structure the string. Some concerns were expressed on URL, such as security and sustainable validity. The meeting felt it was a responsibility of producers and cache will be valid in software if users got a grid information. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_6))

# 2.6.7 Overlay Template URL[⮉](#Cont_2_6)

In GRIB3, the concept of overlay was introduced to extend the bitmap used in GRIB2 to provide information on missing values in the field. The aim was to superimpose a field as a land/sea mask, a vegetation or type of soil map. These are all overlays that can be applied to many fields and encoding them with all the relevant GRIB messages is very inefficient from the volume point of view. ECMWF proposed a way to uniquely locate the overlay GRIB with a URL.

The same discussion in 2.6.6 above applies for this overlay template URL and the same changes will be made to this proposal. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_7))

# 2.6.8 Vertical Domain template and template component for model levels[⮉](#Cont_2_6)

Model levels are defined using a list of parameters and some fields to compute the height or the pressure level. In GRIB2 all the model levels are using the same “Optional list of coordinate values or vertical grid information” which is a part of section 4.

Vertical Domain Templates (VDTs) and VDT components (VDTCs) were proposed to define the list of parameters and the auxiliary field to compute height, depth or pressure together with a table, which contains description of the algorithm to be used and has to be developed with the help of domain specific experts at a later stage.

It was emphasized that this proposal is to provide fields which are needed in decoding but too big when they are in a message. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_8))

# 2.6.10 Templates for spherical harmonics[⮉](#Cont_2_6)

HDTs, a HDTC, Data Representation Templates (DRTs) and DRT components (DRTCs) for spherical harmonics were proposed with the aim to be as close as possible to the GRIB2 representation.

The meeting supported this proposal for validation in consideration of the fact that this proposal was directly taken from GRIB2. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_2_6_10))

# 2.7 BUFR and CREX new editions

# 2.7.1 BUFR new edition, including work plan of TT-BUFR[⮉](#Cont_2_7)

Task Team on BUFR discussed the BUFR edition 5 at its breakout session.

The TT noted that the planning, development and eventual operational implementation of a new BUFR edition needs to avoid interfering with the Migration to TDCF. Therefore it is envisioned that BUFR Edition 4 will remain in use for the operational exchange of SYNOP, TEMP and CLIMAT data for the foreseeable future.

The TT also noted that a new BUFR edition that included only small, incremental changes might not be most productive in the current context where the edition 4 is sufficient to achieve the goals of the Migration to TDCF. A more comprehensive and forward looking approach, resulting in a significantly modernized BUFR edition 5, would provide data producers and users with updated functionalities and characteristics.

The TT further noted that the basic requirements of the BUFR code form were laid out almost 30 years ago and that the landscape of data formats, data management and user needs has evolved greatly since that time.

Finally, the TT recalled the list of feature requests gathered over the past few meetings and noted that they could be required for new data exchange needs.

In view of the above, the meeting agreed that development for BUFR edition 5 should focus on modernizing BUFR with a view of ensuring that users continue to enjoy the strengths of the format, while functionalities that would be required or advantageous in the present operating environment are made available. The TT acknowledged that this could require some significant departures in the code form structure, code tables, and data description syntax.

The meeting agreed that a first step should be to review and reformulate explicitly the basic requirements for the BUFR code form by the end of Calendar Year 2017. The updated requirements would be used as the basis for BUFR edition 5.

Following this review, a gap analysis and work plan would be submitted at the next meeting of the IPET-CM.

# 3. MANUAL ON CODES: REGULATIONS FOR REPORTING TRADITIONAL OBSERVATION DATA IN TABLE-DRIVEN CODE FORMS

# 3.1.1 Regulations for radiosonde descent data[⮉](#Cont_3_1)

See [2.4.2](Report_IPET-CM-I_Geneva_summary.docx#S2017_2_4_2).

# 3.1.2 Regulations for reporting SHIP data in TDCF (B/C10)[⮉](#Cont_3_1)

Within the JCOMM Voluntary Observing Ships (VOS) Scheme, there are 4 primary classes of VOS defined, each split into two subclasses: Selected, VOSClim, Supplementary and Auxiliary.

At the 9th Session of the JCOMM Ship Observations Team (SOT), it agreed to reduce the number of VOS classes to three. To avoid ambiguity with the existing VOS classes new names for the VOS classes have been proposed. The proposed new classes are: NMHS Operated, NMHS cooperative and Independent.

Dr David Berry, JCOMM, proposed amendments to the B/C10 to accommodate the new classes. Dr Berry added these proposed changes to the VOS classes and names of the VOS classes are subject to approval at JCOMM-5 (October 2017).

The meeting went through the revision and agreed as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_3_1_2) to this paragraph the proposal for adoption by the procedure between CBS sessions (ABC2018 for implementation in November 2018), noting that the wording may be modified by the JCOMM-5 approval process; that the NMHS operated (recruited) and selected ships are broadly equivalent; and that the distinguishing feature of NMHS operated is the supply of instruments by the NMHS.

# 3.1.3 Implementation of the Decision 15 of EC-69 regarding the International Exchange of Snow Data[⮉](#Cont_3_1)

The implementation of Resolution 15 (EC-69), International exchange of snow data, which requires that appropriate codes are available for snow depth and snow cover data to be reported once a day (standard practice) and four times a day (recommended practices).

EC-69 in the Decision 38 decided that Manual on Codes (WMO-No. 306), Volume I.1 is no longer subject to change except for aviation. In view of this, amendments to B/C1 were proposed, recognizing reporting of zero snow depth was already incorporated in the B/C Regulations.

The meeting concurred not to amend SYNOP to make zero snow depth reporting possible in view of the decision by CBS-16\*, understanding SYNOP with zero snow depth could be exchanged nationally.

The meeting agreed the proposal, with modifications not to add mandates to Regional Associations, as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_3_1_3) to this paragraph for adoption by the procedure between CBS sessions, recognizing the proposed changes are to reflect the amendments to the Manual on GOS already adopted by Resolution 15 (EC-69).

Editorial note: Rec. 10 (CBS-16)/Dec. 38 (EC-69)

# 4. MANUAL ON CODES: TRADITIONAL ALPHANUMERIC CODES

### 4.1 Possible amendments that result from Amendment 78 to ICAO Annex 3[⮉](#Cont_4)

Mr Greg Brock, the WMO Secretariat, supplied the meeting with a short briefing on Amendment 78 to ICAO Annex 3 – Meteorological Service for International Air Navigation. Mr Brock indicated that the State consultation phase of Amendment 78 had been recently completed by ICAO and that the next steps in the approval process entailed review and approval by ICAO’s Air Navigation Commission and Council in Q4 2017 and Q1 2018 respectively in advance of an applicability date in November 2018.

Mr Brock outlined that Amendment 78 addressed provisions that included a (new) space weather information service and improvements to (existing) SIGMET, AIRMET, volcanic ash and tropical cyclone advisory messages. Mr Brock advised that the amendment would only have a bearing on abbreviated plain language and IWXXM GML forms of these message types and, further, that since there were no proposed changes to METAR/SPECI and TAF in Amendment 78, there would consequently be no impact on the TAC code forms prescribed in the Manual on Codes (WMO-No. 306).

Mr Brock informed the meeting that ICAO was now on a fixed two-year cycle of amending Annex 3 (2018, 2020 and so on) and that WMO was fully engaged in ICAO’s standards-development process through the Meteorology Panel (METP).

Editorial note: During the meeting, it was pointed that RERASN (recent rain and snow) was removed from ICAO Annex 3/WMO Technical Regulations, Volume II but it was still in the Manual on Codes. After the meeting, the ICAO Secretariat has concluded that the removal was rejected in Amendment 77 but was made by mistake when publishing. ICAO considers and will let WMO know how to revert the abbreviation to the Annex 3.

# 5. MANUAL ON CODES: DATA DESIGNATOR[⮉](#Cont_5)

# In relation to this item, the meeting was invited to consider proposing new components of GTS heading, when planning production of new data and products and no corresponding GTS heading is available.

The meeting noticed there was an issue on a primary responsibility on GTS headings, that is, RTHs/GISCs should be responsible. However, there is no more ET-OI, which was a responsible body representing RTHs in OPAG-ISS for GTS headings, and this team has taken over partially the task.

The meeting felt that data producers could discuss within their organizations with WIS/GTS people how to exchange their data and products, by which a lot of things could be handled without this team. Otherwise, the data producers could bring the issue together with their proposal on TDCF to this team with the help of WIS/GTS people.

# 6. SUMMARY AND CONCLUSION OF PROPOSALS

### 6.1 Summary on amendments since IPET-DRMM-IV[⮉](#Cont_6_1)

In accordance with the *Procedures for amending WMO Manuals and Guides that are the responsibility of the Commission for Basic Systems* (Rec.15(CBS-Ext.(2014)/Res.21(Cg-17)/revised by Res.12 (EC-68)), the amendments by the fast-track procedure and the procedure for adoption between CBS sessions were approved by WMO Members (focal points or PRs).

The meeting noted that the amendments have been implemented or adopted (waiting for implementation) after the 4th meeting of IPET-DRMM as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_6_1a) to this paragraph.

Furthermore, the meeting confirmed status of the proposals, which have been approved for validation, on amendments to the Manual on Codes one by one as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_6_1b) to this paragraph.

# 7. LIST OF AMENDMENTS BY FAST-TRACK

### 7.1 Drafting of list of amendments by fast-track (FT2017-2)[⮉](#Cont_7_1)

The meeting went through all amendments for adoption by the next fast-track procedure in detail and one by one, which were proposed so far, including this meeting, and finalized the list of amendments (FT2017-2) as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_7_1) to this paragraph. This measure was required exceptionally in order to save time for implementation of amendments in time (November 2017).

# 8. MIGRATION TO TABLE-DRIVEN CODE FORMS

### 8.1 Status of migration by WWW Monitoring Exercise[⮉](#Cont_8_1)

The Special Main Telecommunication Network Monitoring (SMM) is carried out four times a year. Status of migration was presented based on the result of SMM from 1 to 15 April 2017.

There were days in April 2017 when not all upper air BUFR reports were recorded in the SMM files, so for some regions the number of upper air BUFR reports was under-reported. For that reason, statistics were gathered additionally on enough days for a quantitative assessment of the progress. Additional charts (see pp.75/76 in the annex to this paragraph) have been inserted to show the results from the independent analysis of the Integrated WWW Monitoring (IWM). In April 2017, the processing of CLIMAT reports by the RTHs was incomplete, so statistics are not available for those reports.

The Tables 1 and 2 compare the percentage of required reports received from stations in TDCF and in TAC, which are broken down by regions (four reports a day are required from surface stations, two are required each day from upper air stations). Charts 1 and 2 together with the additional charts shows availabilities in TDCF and TAC for each observing station.

Availability of TDCF data is comparatively low in Regions I, III and Antarctica for surface observations and Regions I, II, III and Antarctica for upper-air observations. As stated above, an inconsistency (under-reported) was identified in the Table 2 and the Chart 2 for upper-air data. Participants concerned will check their monitoring result for the inconsistency. (see [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_1))

# 8.2 Reports by members on status of migration

### 8.2.1 Status of migration in RA I[⮉](#Cont_8_2)

Mr Abderrazak Lemkhenter, Direction de la Météorologie Nationale du Maroc, presented the status of migration in Region I.

Mr Lemkhenter summarized that despite the difficulties encountered by many NMHSs in Region I, great progress had been made in the TDCF migration between May 2016 and July 2017.

Mr Lemkhenter reported the main challenge was the lack of adequate connections supporting the transmission of BUFR reports. The migration process at the level of RTH has gone well: the RTH converts the TAC data into TDCF and transmits them to the GTS. This process can temporarily replace migration at the NMHS level and meets the needs of the meteorological community.

Mr Lemkhenter added, just prior to the meeting in early July 2017, a questionnaire was sent to all TDCF focal points, but several emails were rejected because of "non-existent address". Only four responses are received, from Kenya, Tunisia, Mauritius and Morocco, which is as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_1) to this paragraph.

Mr Lemkhenter drew attention to some issues he encountered, recommendations to which are in the annex to this paragraph. It was informed with regard to the recommendation 3 that no regional association has this permanent monitoring system and ECMWF has been providing not officially availability of TAC and TDCF reports, which is a great and useful resource.

The meeting thanked Mr Lemkhenter for his initiative and involvement for the migration to TDCF in Region I.

### 8.2.2 Status of migration to TDCF in RA II[⮉](#Cont_8_2)

Following the decisions of the 16th session of Regional Association II (Abu Dhabi, February 12-16, 2017), the Management Group defined working structures and the terms of reference of Working Groups and Leaders.

The Leader of Data Representation and Metadata, appointed under the Working Group on WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) (WG-WIGOS/WIS), is responsible for:

(a) Keeping under review inter-programme data representation matters, including migration to Table Driven Code Forms and regional codes, and make recommendations.

(b) Keeping under review the status of implementation of the WIS DAR metadata catalogue and migration from WMO Catalogue of Meteorological Bulletins (Volume C1) to DAR metadata.

In accordance with this mandate, the Leader monitors and gives technical assistance as well as conducts survey on migration status on a regular basis.

Mr Shuichi Ikeda, Japan Meteorological Agency (JMA), presented the monitoring results on migration status of RA II members as of April 2017 and related activities by RA II members during the period between June 2016 and June 2017, which are summarized in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_2) to this paragraph.

Mr Ikeda reported that JMA plans to start providing high resolution native BUFR upper-air reports in 2018, replacing BUFR reports converted from TEMP. JMA will continue to provide TEMP in parallel at least one year.

The meeting thanked Mr Ikeda and Ms Hasegawa, who is the co-author, for their continuing initiative to the migration in Region II.

### 8.2.2.1 Activities on the MTDCF in China[⮉](#Cont_8_2)

Ms Fang Zhao, CMA, presented the status of migration to TDCF in China.

Ms Zhao notified that BUFR SYNOP data at intermediate synoptic hours 03, 09, 15, 21 from 384 SYNOP stations were produced and disseminated on GTS in June 2017 using template 3 07 080. She added the available bulletins are distributed under the headers, ISIN[21-39] BABJ.

With regard to metadata, Ms Zhao reported that Dr Bruce Ingleby of ECMWF kindly advised some deviations in Chinese BUFR SYNOP and BUFR TEMP from the WMO Publication No. 9, Vol. A, such as latitude/longitude and height. Then, the comparison of position metadata between Message Switching System (MSS), Vol. A and OSCAR was made. She mentioned the station metadata information of MSS was updated to fix the problem.

Ms Zhao accordingly emphasized that the validation of data quality is the basic task of the data providers, but the verification and direct feedback from end users are still effective and valuable for improving the quality of the data.

The meeting thanked Ms Zhao and CMA for the progress on migration and also their actions to solve the issue of metadata inconsistency between BUFR and other resources.

### 8.2.3 Status of migration in RA III[⮉](#Cont_8_2)

Dr Sergio Henrique Soares Ferreira, Centro de Previsao de Tempo e Estudos Climaticos (CPTEC)/INPE, presented the status of migration in Region III, which is based on the information provided by experts and focal points in the region, following a request to most of them as well as monitoring and verification of BUFR bulletins on GTS.

Dr Ferreira summarized significant progress that has been made by major national centres in Region III on the replacement of TAC to TDCF. He mentioned the majority of the countries in the region had an opportunity to attend the BUFR workshop in Montevideo and since then they are working on their implementation.

Dr Ferreira was concerned that many countries are operationally providing data in BUFR but the migration is not yet complete. He felt some TDCF data needed to be adjusted for correct coding and transmission.

The status of individual country and the result of monitoring in Region III on the migration to BUFR are as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_3) to this paragraph.

The meeting thanked Dr Ferreira and Mr Jose Mauro de Rezende, INMET, who is the co-author, for their active involvement in the migration to BUFR in Region III.

### 8.2.4.1 Availability of high-resolution radiosonde data from U.S.A.[⮉](#Cont_8_2)

Mr Jeffrey Ator, NOAA/NWS, presented the migration status on high-resolution radiosonde data in United States.

Mr Ator reported that following the successful completion of system and field testing, the NOAA/NWS has begun disseminating high-resolution radiosonde data from many of its upper-air observing stations in real time on the GTS, which are listed in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_4_1) to this paragraph.

Mr Ator advised that the high-resolution products all use the ICAO identifier of the actual site in the CCCC of the product header, i.e. other than CCCC = KWBC, which means those converted from TAC at RTH Washington. He invited WMO Members to begin using the above high-resolution products, all of which use the new BUFR 3 01 128 sequence descriptor for radiosonde ascent metadata preceding the standard 3 09 052 sequence descriptor for radiosonde level data.

Mr Ator added that additional sites are coming on-line every month, with the roll-out of updated software to all sites progressing in a nominally East-to-West direction across the United States. Sites mostly in the Eastern United States are being migrated first, followed by sites in the Southern, Central and Western regions, and concluding with the Alaskan and Pacific region sites sometime in early-mid 2018. As the roll-out progresses, corresponding TAC-converted reports which use the CCCC = KWBC originator will begin to be removed from the GTS.

Mr Ator emphasized that the above migration only covers sites operated and managed by the NOAA/NWS. Sites operated by the U.S. military (mostly in block 74) will move to native high-resolution capability under a separate program at some later date still to-be-determined.

The meeting thanked Mr Ator and United States for their initiative to make the native upper-air reports available to WMO Members.

### 8.2.4.2 Status of the migration to TDCF in Canada[⮉](#Cont_8_2)

Mr Yves Pelletier, Meteorological Service of Canada (MSC), informed that synoptic surface observations are produced by MSC in both BUFR and TAC. BUFR is produced by MSC software from a variety of native raw data code forms, mostly from automated observing platforms.

Mr Pelletier emphasized that overall quality of the BUFR SYNOP is at least equivalent to the legacy TAC SYNOP. He expected quality of the metadata will improve gradually as planned software infrastructure and data management upgrades are implemented.

With regard to upper-air data, Mr Pelletier expressed that a half of Canada’s network of about 30 upper-air stations dual-produce BUFR and TAC at the stations and the remainder continue to produce TAC TEMP. MSC is examining whether sounding resolution could be improved further, given communications and infrastructure constraints.

Mr Pelletier pointed that the conversion of aerological stations to allow the production of BUFR TEMP is time-consuming and involves new communications infrastructure and on-site hardware and software upgrades at remote locations.

Mr Pelletier mentioned that MSC is able to receive and process BUFR SYNOP and TEMP from third parties. Reception is dependent on the quality of BUFR encoding by the producer. No date has been yet decided for Canada to cease TAC SYNOP and TEMP production.

Mr Pelletier expressed that the migration of TAC CLIMAT to BUFR is contingent on planned software and data management upgrades by MSC, which is estimated around mid-2018.

The meeting thanked Mr Pelletier for his initiative for the migration in Canada, which is bearing fruit on the migration.

### 8.2.5.1 TDCF Migration for Hi-Res Radiosonde and Hourly SYNOP data from Australia[⮉](#Cont_8_2)

Dr Yang Wang, Australian Bureau of Meteorology (BoM), presented the status of migration to BUFR in Australia.

Dr Wang informed that BoM began to generate high-resolution upper-air radiosonde data from 28 October 2015, which bulletin headers are in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_5_1) to this paragraph. He added the conversion from TAC to BUFR has been terminated after distribution of the high-resolution data.

With regard to surface observations, Dr Wang added BoM’s surface observations are made at one-minute interval across the observation network and processed to generate TAC SYNOP reports every 3 hours.

Dr Wang further added that BUFR messages converted from TAC SYNOP are currently in global exchange. However, the BUFR messages are not adding more information that the format was designed to offer. BoM will create hourly BUFR SYNOP reports directly from the source data using WMO “BUFR Template for Representation of SYNOP data with Supplementary Information on One-hour Observations” (TM307096) for all stations (each UTC hour) and 96 stations (every 3 hours on UTC half hour).

The meeting thanked Dr Wang for his detailed information and his involvement in the migration in Australia.

### 8.2.7 Status of migration in JCOMM[⮉](#Cont_8_2)

Dr David Berry, JCOMM, explained status of migration by JCOMM, which is summarized in the annex to this paragraph: a) number of observations in TAC and BUFR from marine platforms and b) templates for reporting marine meteorological and oceanographic observations in BUFR.

Dr Berry expressed the majority of marine observations for buoys, VOS and profiling Argo floats were now reported in either TAC and BUFR or BUFR only as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_7a) to this paragraph.

Dr Berry added: a) the representation of wave data in the template for moored buoys has been flagged as insufficient (revision undergoing), b) migration to BUFR for E-ASAP observations was completed in 2016, c) migration of BATHY reports to BUFR is underway (almost complete), and d) a BUFR template for TRACKOB is available but has been reported to include limited metadata (revision undergoing).

The meeting thanked Dr Berry and JCOMM for what Dr Berry and JCOMM achieved for the migration to TDCF and also for maintaining the mapping table in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_8_2_7b).

In relation to the presentation by JCOMM, the meeting supported the idea that initiatives by other technical commissions (TCs) could also contribute to the migration to TDCF in consideration of the fact that members of the Commission for Basic Systems (CBS) are not all directly responsible for the migration of specific data in their NMHSs.  The meeting therefore agreed to invite suitable bodies within other TCs concerned to take initiatives on the migration to TDCF for specific data in cooperation with the members of CBS in their NMHSs.

# 9. PUBLICATION

### 9.1 Additional columns for element descriptions in machine readable TDCF tables[⮉](#Cont_9)

Some members of IPET-DRMM has proposed amendments to the Manual on Codes (WMO-No. 306) together with descriptive information on table entries in Table-Driven Code Forms (TDCF).

The Secretariat has populated these information into the TDCF tables database so that the information is available for proper use of these entries. The tables will be released from the WMO web at:

http://www.wmo.int/pages/prog/www/WMOCodes/WMO306\_vI2/LatestVERSION/LatestVERSION.html

The meeting noted that the new machine readable TDCF tables with the descriptive information will be made available on an experimental basis in addition to the current machine readable tables with no such information, that is, the current machine readable tables are also available with no changes.

# 10. IPET-CM AND TASK TEAMS

### 10.1 IPET-CM and establishment of task teams[⮉](#Cont_10)

The 16th session of the Commission for Basic Systems (CBS-16) took place in Guangzhou, China, 23–29 November 2016.

CBS-16 re-established four Open Programme Area Groups (OPAGs), i.e. OPAG on Integrated Observing Systems (IOS), OPAG on Information Systems and Services (ISS), OPAG on Data Processing and Forecasting Systems (DPFS) and OPAG on Public Weather Services Delivery (PWSD).

Inter-Programme Expert Team on Codes Maintenance (IPET-CM) was established under OPAG-ISS to take over the former Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM).

The meeting agreed establishment of four TTs under IPET-CM together with terms of reference (TORs) and appointed leads of TTs as in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_10_1) to this paragraph. In this regard, the meeting agreed the TORs should be achievable derivable.

The work plans of TT-GRIB and TT-BUFR are shown in respective agenda items (see 2.6 and 2.7). With regard to TT-MTDCF, the chair of IPET-CM offered to be a liaison with the WIGOS team on WDQMS issue. TT-AvCI will review Amendment 78 to ICAO Annex 3 and as shown in the editorial note to 4.1, the removal of RERASN is no more an issue.

# 11. COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES

### 11.1 Report from CBS-MG Task Team on Upper Air BUFR[⮉](#Cont_11)

In June 2015, CBS Management Group formed the Task Team on Upper Air BUFR (TT-UABUFR) to address problems experienced by NWP centres in processing upper air BUFR reports. By CBS-16, the TT had recommended that upper air reports in BUFR should comply to the regulations B/C20 and B/C25, and that Members who could not create such reports should continue to report only in TAC. This was recorded as Decision 5 (CBS-16).

In July 2017, the TT submitted to the Secretariat a draft report on how systematic errors in upper air BUFR reports could be addressed, asking for advice on how the proposal could be built into the WMO systems. That proposal was similar to the procedures envisaged by the WIGOS Data Quality Management System (WDQMS), but needed to be implemented more rapidly.

A teleconference on 7 July 2017 between representatives of the TT, chairs of relevant Expert Teams and the Secretariat concluded that the proposal of the TT should be treated as a pilot project for the WDQMS. The WIGOS Regional Centres that will form part of the WDQMS have not yet been created, so the teleconference proposed that in the pilot, the GISCs play the role of WIGOS Regional Centres in working to improve the quality of reporting with the countries supplying erroneous reports.

The next step in implementing the pilot project is to obtain agreement from GISCs that they will perform the coordinating role until the WIGOS Regional Centres become operational. The outline of the proposed procedure is in the [annex](Report_IPET-CM-I_Geneva_annex.docx#A2017_11_1) to this paragraph.

It was pointed that this issue needs good collaboration with WIGOS, i.e. coding and observations, and this type of task should be taken by operational centres and not by individual experts.

### 11.2 Implementation of the WIGOS Station Identifiers[⮉](#Cont_11)

Mr. Richard Weedon, UK Met Office (UKMO), presented the paper and conveyed the concerns over migration to WIGOS Identifiers expressed by user community, especially by NWP centres.

The meeting agreed on the view that although data users always welcome an increase of observation data available, the community should not underestimate the impact of introduction of WIGOS Identifiers that eventually replace traditional 5-digit identifiers, because the current system of station identification has the potential to impact all systems tasked with the processing and storage of observational data.

The meeting recalled existing guidance on the use of WIGOS Identifiers in BUFR/CREX format and considered the possibility to include the practices in B/C regulations as the standard, but concluded that a letter to remind Members of the instructions would be more appropriate, because amendments of B/C regulations took too long. The team agreed to send a letter to WMO Members to remind of technical details in reporting WIGOS Identifiers in BUFR/CREX format:

i) When Members report data using BUFR/CREX templates defined in B/C regulations of the Manual on Codes (and other BUFR/CREX sequences suitable for report specific data sets) and include WIGOS Identifiers, the sequence for reporting WIGOS Identifier (3 01 150) should be placed before the BUFR/CREX templates and other BUFR/CREX sequences.

ii) When Members report data from observation sites that have traditional 5-digit location identifiers, the traditional identifiers (0 01 001) and WMO station number (0 01 002)) should also be reported in addition to corresponding WIGOS Identifiers (3 01 150), to make sure the continuity of data use.

iii) BUFR/CREX reports that include the sequence for reporting WIGOS Identifier (3 01 150) should have master table version number 28 or later, because the sequence is not defined in the tables with version numbers before 28.

Editorial note: As a remaining issue for the letter to be sent to Member states, the meeting noted: a) importance of notification at least two months (preferably three months) in advance by METNO as defined in the Manual on the GTS, and b) possibility of dual transmission of BUFR messages with and without WIGOS Station Identifier sequence (3 01 150), whenever introducing WID in new or existing BUFR messages, keeping in mind WID has profound impact to operational systems.

### 11.3 XML parsing in decoding systems[⮉](#Cont_11)

With the endorsement of IWXXM (ICAO Meteorological Information Exchange Model), a decoding system needs to be capable to process XML files. Depending on the system architecture, a decoding system is often the first system which parses the content of a bulletin/message while the other systems mainly switch the messages.

The default configuration of XML parsers often allows the processing of DTD (document type declaration) and schema – IWXXM uses a schema definition and potentially makes decoding systems vulnerable to XXE (XML External Entity) attacks.

Mr Markus Heene, DWD, presented remotely a paper on XML parsing in decoding systems with examples of potential XXE attacks and provided with resources for further studies about hardening XML parsers in case of Java.

The meeting thanked Mr Heene and noted the useful information will be shared within each organization of the participants.

The meeting also agreed to pass this information to ET-WISC, TT-AvXML and ICAO team working on meteorological information to raise awareness on this risks. Also, HMEI agreed to discuss with the Executive Secretary of HMEI how to share the information with other members.

### 11.4 Implications for the CM Team of provision of the WMO codes Registry[⮉](#Cont_11)

Mr. Richard Weedon, UKMO, presented a paper that gave information on the background and the current status of the WMO codes registry and proposed a content management work flow. The paper also suggested an investigatory work of information included in the registry that could be conducted by IPET-CM members. A comment received was that the investigatory work especially in a multi-lingual environment requires a lot of resources and one member might not be enough.

The team noted the activity of development of WMO codes registry and would consider its contribution when the scope of work and its regulatory status is clarified, in relation to the existing Manual on Codes and its machine-readable tables.

# 12. CLOSURE OF THE MEETING

The meeting was closed at 15:35 on Friday 28 July 2017.

* **ANNEX TO PARAGRAPH 1.2**[**⮉**](#S2017_1_2)

**PROVISIONAL AGENDA**

|  |  |
| --- | --- |
| **1** | **ORGANIZATION OF THE MEETING** |
|    1.1  |    Opening of the meeting |
|    1.2  |    Approval of the agenda |
|    1.3  |    Working arrangement |
| **2** | **MANUAL ON CODES: TABLE DRIVEN-CODE FORMS** |
|    2.1 |    Amendments to GRIB regulations |
|  2.2 |  Additions to GRIB templates and tables |
|    2.3 |    Amendments to BUFR/CREX regulations |
|    2.4 |    Additions to BUFR/CREX tables |
|    2.5  |    Additions to Common Code tables |
|  2.6 |  GRIB edition 3 |
|  2.7 |  BUFR and CREX new editions |
| **3** | **MANUAL ON CODES: REGULATIONS FOR REPORTING TRADITIONAL OBSERVATION DATA IN TABLE-DRIVEN CODE FORMS** |
|  3.1 |  Amendments to B/C Regulations for ... |
|  **4** | **MANUAL ON CODES: TRADITIONAL ALPHANUMERIC CODES** |
|    4.1 |    Possible amendments that result from Amendment 78 to ICAO Annex 3 |
|  **5** | **MANUAL ON GTS: DATA DESIGNATOR** |
|  **6** | **SUMMARY AND CONCLUSION OF PROPOSALS** |
|    6.1 |  Summary on amendments since IPET-DRMM-IV |
|  6.2 |  Conclusion on past proposals (in lieu of PFC) |
|  **7** | **LIST OF AMENDMENTS BY FAST-TRACK** |
|  7.1 |  Drafting of list of amendments by fast-track (FT2017-2) |
| **8** | **MIGRATION TO TABLE-DRIVEN CODE FORMS** |
|    8.1 |    Status of migration by WWW Monitoring Exercise |
|  8.2 |  Reports by members on status of migration |
| **9** | **PUBLICATION** |
|  9.1 |  Additional columns for element descriptions in machine readable TDCF tables |
| **10** | **IPET-CM AND TASK TEAMS** |
|  10.1 |  IPET-CM and establishment of task teams |
| **11** | **COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES** |
|  11.1 |  Report from CBS-MG Task Team on Upper Air BUFR (TT-UABUFR) |
|  11.2 |  Implementation of the WIGOS Station Identifiers |
|  11.3 |  XML parsing in decoding systems |
|  11.4 |  Implications for the CM Team of provision of the WMO Codes Registry |
| **12** | **CLOSURE OF THE MEETING** |

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

**ON CODES MAINTENANCE (IPET-CM)**

(GENEVA, SWITZERLAND, 24 - 28 JULY 2017)**[⮉](#S2017_1_2)**

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