**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR BASIC SYSTEMS**

**THIRD MEETING OF**

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

**FINAL REPORT**

**MARRAKECH, MOROCCO, 15 − 19 APRIL 2019**

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Chairperson, Publications Board

World Meteorological Organization (WMO)

7 bis, avenue de la Paix Tel.: +41 (0)22 730 84 03

P.O. Box No. 2300 Fax: +41 (0)22 730 80 40

CH-1211 Geneva 2, Switzerland E-mail: Publications@wmo.int

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**Executive Summary**

The third meeting of the Inter-Programme Expert Team on Codes Maintenance (IPET-CM) took place in Marrakech, Morocco from 15 to 19 April 2019.

The meeting reviewed the proposals submitted to the meeting or with validation status already on GRIB Edition 2, BUFR and CREX in Volume I.2 of Manual on Codes (WMO-No. 306). It agreed proposals duly validated or non-controversial for implementation as summarized below.

– New entries for evapotranspiration rate, presence of snow squalls, ocean modelling and post-processing diagnostics/nowcasting forecasts\* in GRIB Edition 2 (GRIB2)

– New GRIB2 templates for spatio-temporal changing tiles\*

– Comprehensive proposals for space weather in GRIB2\*

\* Urgent validation is required.

– New BUFR descriptors and an associated code table for limb profiler ozone data

– New BUFR template for AMDAR profile products

– New BUFR template for the first five Fourier components of the wave spectrum

– New entries for EUMETNET E-Profile, FY-2H, Sentinel-6A/6B and radio altimeter on POSEIDON-4 in Common Code tables

– Revision of XBT fall rate equations, editorial corrections to atmospheric and chemical or physical constituent types and allocation of a range for experimental use in Common Code tables

The meeting reviewed the new idea for BUFR Edition 5, which is to explore GRIB Edition 3 as a universal data representation binary code form. It agreed that the idea should be further investigated.

The meeting recognized the requirements submitted by ICAO on notation of time and missing values in aviation codes. It agreed to draft the amendments based on the ICAO's requests through its task team, TT-AvCI, and will take necessary measures for the implementation in consultation with the ICAO Secretariat.

The meeting reviewed the status of migration to TDCF derived from WWW Monitoring Exercise in January 2019. It identified several areas where the migration was still less progress. The regional representatives appointed to IPET-CM have started their contribution to the migration in their regions. The result of the monitoring will be shared by them for further actions.

The meeting reviewed the Category of Amendments (CA), which was agreed at the IPET-CM-II for experimental use and updated for this meeting to reflect the WMO regulatory framework for data production. It agreed the updated CA be used further within CBS, although still experimental.

Reporting practices are available in Manual on Codes, Volume I.1, which are being obsolete in accordance with the progress of the migration to TDCF, and also available in the Manual, Volume I.2 for specific traditional observations. The meeting decided to raise the issue of new reporting practices, which will replace the above, to a responsible technical commission. It agreed to add the task to the future Terms of Reference of the team.

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

**(MARRAKECH, MOROCCO, 15 − 19 APRIL 2019)**

# 1. ORGANIZATION OF THE MEETING

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

The third meeting of the Inter-Programme Expert Team on Codes Maintenance (IPET-CM) took place at the ATLAS ASNI Hotel in Marrakech, Morocco from 15 to 19 April 2019.

Ms Jitsuko Hasegawa, chairperson of IPET-CM, thanked participants and expressed sincere appreciation to Maroc Météo who kindly hosted this meeting in this beautiful city, Marrakech.

Mr **Hassan Haddouch**, on behalf of Director of Maroc Météo, welcomed the participants and thanked for a lot of work. Mr Haddouch expressed Manual on Codes plays the key role in collection of data from stations. He wished the fruitful and successful meeting and stay in Marrakech beautiful place to visit.

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

The meeting agreed on the [agenda](#A2019_1_2a), which is in the Annex to this paragraph along with the [list of participants](#A2019_1_2b) without changes.

# 1.3 Working arrangement[⮉](#Cont_1)

Ms Jitsuko Hasegawa, chairperson of IPET-CM, presented the initial working plan to incorporate remote participation of the regional representatives in the issue of migration to Table-Driven Code Forms (TDCF) from different time zones together with necessary adjustments. The meeting agreed with the updated working plan, recognizing that it will be modified flexibly when needed.

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

# 2.1 Amendments to GRIB regulations

(none)

# 2.2 Additions to GRIB templates and tables

### 2.2.1 New GRIB2 parameter for evapotranspiration rate[⮉](#Cont_2_2)

Mr Jeffrey Ator, NOAA/National Weather Service (NWS), raised the issue of wrong unit of evapotranspiration in the Code table 4.2 of GRIB Edition 2 (GRIB2), which was initially noted by U.S. Air Force and National Aeronautics and Space Administration (NASA) and once discussed last year. The consensus of the discussion last year was that a note should be added to the existing parameter to document the concern about the units, and at the same time a new "rate" parameter should be added with the correct units.

In view of the above, Mr Ator proposed the new parameter, “Evapotranspiration rate” with units kg m-2 s-1. Per the rules of GRIB2 a user may, if needed, use this new parameter along with statistical “Accumulation” (code figure 1) from Code table 4.10 to derive “Evapotranspiration” in units of kg m-2 in the corresponding data section of a GRIB2 message.

The meeting agreed, in view of the last year's concurrence, the proposal for FT2019-2 (Category 1d) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_1) to this paragraph. Given that NASA would like to begin using this new parameter in GRIB2 products during the summer of 2019, the meeting also agreed for **pre-operational use**.

In relation to the proposal, since the entry was one of the entries copied from GRIB Edition 1 (GRIB1) and these entries are expected to be copied to the relevant table of GRIB Edition 3 (GRIB3), it was suggested that such entries should also be checked. The meeting concurred with the initiative, recognizing it requires support from the relevant scientific experts. The Secretariat will share the list of entries copied from GRIB1.

### 2.2.2 New GRIB2 Code table 4.2 entries for snow squalls[⮉](#Cont_2_2)

Mr Yves Pelletier, Meteorological Service of Canada (MSC), proposed a new parameter, "Presence of snow squalls" for winter severe weather forecasting and reflects new post-processing diagnostics forecasts being implemented at the Canadian Centre for Meteorological and Environmental Prediction. Mr Pelletier hoped that it was sufficiently general for eventual use by other centres.

The meeting review the proposal and agreed without changes for FT2019-2 (Cat. 1d) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_2) to this paragraph.

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

Mr Yves Pelletier, MSC, presented additions to Code table 4.2 of the GRIB2, which are to reflect new post-processing diagnostics and nowcasting forecasts being implemented at the Canadian Centre for Meteorological and Environmental Prediction. Mr Pelletier hoped that they are sufficiently general for eventual use by other centres.

The meeting agreed the proposal, which is in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_3) to this paragraph, to be reviewed after the meeting by the end of June, pursuing adoption by FT2019-2.

### 2.2.4 New templates for spatio-temporal changing tiles[⮉](#Cont_2_2)

The coding of spatio-temporal tiles at a point in time for deterministic forecasts (Product definition template 4.55) and for individual ensemble forecast (Product definition template 4.59) is already defined and used by Deutscher Wetterdienst (DWD), however, the definitions including a statistical process are missing. Ms Sibylle Krebber, DWD, proposed new product definition templates for deterministic and ensemble forecast of spatio-temporal changing tiles in order to complete the set of tile templates. The proposed templates composed of the existing PDT 4.55 and 4.59 and statistical process definitions.

The meeting agreed the proposal for FT2019-2 (Cat. 1d) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_4) to this paragraph, provided the validation will be finished by the end of June 2019. NCEP will assist the validation.

### 2.2.5 Space Weather in GRIB2[⮉](#Cont_2_2)

At the IPET-DRC-II in Brasilia (August 2010), the team discussed ideas for the representation of space weather in GRIB2. This was initiated by a topical paper from the U.S., and the results are documented in item 2.3.11 of the final report from the meeting.

In accordance with the guidance provided by IPET-DRC-II, the NCEP Space Weather Prediction Center (SWPC) has worked closely with UK Met Office (UKMO) and US Air Force over the year 2010/2011 to develop a formal proposal for validation. Some validations were made, but then the validation process stopped and the proposal was withdrawn at the IPET-DRMM-II meeting in College Park in 2014.

Based on the increased relevance of space weather products and services in aviation and with respect to related ICAO and WMO activities in establishing global space weather centres, Ms Sibylle Krebber, DWD in cooperation with German Aerospace Centre (DLR) proposed the revision and extension of the GRIB2 data. The final goal is to harmonize space weather and meteorological data bases to foster inter-operability of the existing complex systems using the GRIB2 format.

It was suggested this issue should be raised to the CGMS Coordination Group on Space Weather, which will hold a meeting in May 2019, for their feedback, and IPET-SWeISS. IPET-CM will come back to this issue to reflect their feedback in the proposal.

In this context, a staff member of the Secretariat, who is supporting aviation issues of CAeM and ICAO, expressed by email that there is no ICAO aeronautical requirement in GRIB2 code form for the space weather advisory information in support of international air navigation to be made available to aviation end users. Rather, the required format of the space weather advisory information is: 1) abbreviated plain language; and 2) IWXXM GML (ICAO meteorological information exchange model, geography mark-up language).

The meeting noted the comment from the Secretariat and highlighted that the proposal is at the moment for voluntary production (Cat. 1d) by space weather centres, which use other formats, and hopefully become a standard in the future.

The meeting agreed the renaming of entry 3, Space product, in Code table 0.0 and the new unit in C-6 for FT2019-2 as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_5) to this paragraph, and rest will be reviewed by CGMS and IPT-SWeISS. If validation is achieved by the end of June 2019, the proposal will be in FT2019-2 (Cat. 1d).

### 2.2.6 **New parameters and types of level for Ocean modelling**[⮉](#Cont_2_2)

During the last fast-track amendments, European Centre for Medium-range Weather Forecast (ECMWF) requested the parameter “practical salinity” as a sub-surface property (discipline 0, category 4). Ms Marijana Crepulja, ECMWF, proposed new parameters in Code table 4.2 and 4.5 to extend it to surface property as well (discipline 0, category 3).

In consultation with experts in ECMWF later, Ms Crepulja requested to modify the unit from "psu(numeric)" to "Numeric", which results in the same change to the previous proposal in FT2019-1 underway.

The meeting agreed the proposal for FT2019-2 (Cat. 1d) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_6) to this paragraph.

### 2.2.7 New GRIB2 code Table 4.2 entries[⮉](#Cont_2_2)

Norwegian Meteorological Institute (NMI) requested entries in Code table 4.2, which parameters are of crucial importance for the Copernicus Arctic Regional Reanalysis project to start very soon. Since these parameters have been widely used as GRIB1 parameters in the hirlam numerical weather prediction community, and it is believed that they will be of high relevance outside the aforementioned reanalysis project.

Since the proposal has been submitted during the meeting and requires specific scientific expertise, the meeting decided to draft the amendment with a small group and then share it with other participants of the meeting. Dr Sebastien Villaume, ECMWF, offered to support the drafting work. The initial proposal is as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_7) to this paragraph.

### 2.2.8 New GRIB2 parameters and templates for atmospheric composition modelling[⮉](#Cont_2_2)

Recent developments in atmospheric composition modelling includes the partitioning of the traditional modelled processes into contributions of several source sectors: biogenic and anthropogenic sources, natural events, etc.

Dr Sebastien Villaume, ECMWF, presented the proposal for the next steps to be taken at ECMWF. The “option 1” of the proposal shows the partitioning of the emission fluxes per sources. It is relatively straightforward but has the disadvantage to quickly fill the available entries in the Code table 4.2, discipline 0, category 20.

Considering that it is likely that the number of partitioned processes (emission, mass mixing ratio, etc.) and the number of sources will continue to grow, the meeting preferred option 2 that uses a new set of templates.

Dr Villaume also proposed a new code table 4.238, which could also be used to host “sinks” or chemical/physical processes. For instance, the vegetation can be considered as a source or a sink of chemical species, i.e. absorb/release dioxygen, carbon dioxide, etc.

In accordance with the discussion with Dr Villaume, the meeting decided to modify the name of Code table 4.238, which are also used in the proposed templates, which is as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_2_8) to this paragraph.

# 2.3 Amendments to BUFR/CREX regulations

(none)

# 2.4 Additions to BUFR/CREX tables

# 2.4.1 New BUFR descriptors for limb profiler ozone data[⮉](#Cont_2_4)

U.S. National Environmental Satellite, Data and Information Service (NESDIS) is planning to make limb profiler data available in BUFR from the Ozone Mapping Profiler Suite (OMPS) instruments on the Suomi-NPP satellite.

Mr Jeffrey Ator, NOAA/NWS, proposed a new BUFR Table D sequence and three new Table B descriptors developed for the above limb profiler data.

Mr Ator explained the background that the original proposal was submitted to CGMS satellite team in October 2018, and no adverse comments were received. Subsequently, the same proposal was forwarded to the full IPET-CM team in early February 2019, along with a sample encoded BUFR message for validation. The proposal was validated, but additional feedback included a request from ECMWF as to whether some additional Table B elements could be included within the proposed Table D sequence.

In view of the comments to the initial proposal, NOAA decided to go ahead with the proposal for the three new Table B descriptors to begin disseminating the data. The Table D sequence will likely be submitted to IPET-CM later to replace the longer list of descriptors in Section 3, pending further discussions between experts in NESDIS and ECMWF.

Mr Ator also requested pre-operational status, since NESDIS will make their limb profiler ozone data available to users beginning in May 2019.

The meeting recognized the situation of urgent needs of Table B descriptors and agreed the proposal for FT2019-2 (Cat. 1d) with pre-operational status as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_4_1) to this paragraph.

# 2.4.2 Development and Validation of a BUFR sequence for AMDAR Profile products[⮉](#Cont_2_4)

Mr Richard Weedon, UKMO, proposed a new Table D sequence, which will be needed in the immediate future, for AMDAR profile product developed by the EUMETNET Observations team, as a means of solving problems encountered in the visualisation of AMDAR ascent and descent data, especially on forecaster display stations.

The meeting agreed with the proposal for FT2019-2 (Cat. 1d), which has been validated, with pre-operational status as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_4_2) to this paragraph.

For information, the BUFR data will be distributed on the GTS with the TTAAii CCCC: IUO[A-L]01 EGRR, where [A-L] represents the same geographical area as the normal AMDAR BUFR data.

# 2.4.3 Reporting CryoSat-2 NOP observations using element 0-25-190 following BUFR sequence 3-12-071[⮉](#Cont_2_4)

European Space Agency (ESA) is replacing all Near Real Time (NRT) data, including Fast Delivery Marine (FDM) product, by Near-Real Time Ocean product (NOP), which includes observations produced from the three operation modes: Low Resolution Mode (LRM), SAR and SARIN. The operating modes need to be distinguished in order to assimilate the observations properly using their correct error characteristics.

ECMWF collaboratively with ESA will provide NOP in BUFR, which is of interest for the data assimilation in NWP models.

Ms Marijana Crepulja, ECMWF, asked the meeting use of 3 12 071 (CryoSat-2 SIRAL altimeter) for reporting CryoSat-2 NOP together with 0 25 190 for different operational modes.

In view of the technical discussion with regard to application of significance at the end of sequence, the meeting noted what ECMWF explained but concluded not to add a note to Table D. Instead, it advised that the users should be notified of the additional descriptor in the sequence through the operational newsletter.

### 2.4.4 Table D sequence for reporting marine observations from unmanned surface vehicles[⮉](#Cont_2_4)

Observations from unmanned, or autonomous, surface vehicles are currently converted to BUFR and inserted on to the GTS using the sequence for drifting buoys (315009). However, this sequence is inadequate for the full range of observable parameters and sensors on the surface vehicles. Additionally, the use of the incorrect template leads the observations being mis-attributed to drifting buoys, resulting in the location and platform motion being incorrectly flagged by quality control/assurance systems.

Dr David Berry, representative from Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), proposed a Table D sequence to address these issues as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_4_4) to this paragraph.

Dr Berry hoped the proposal would be validated by November 2019 and operational by FT2020-1. ECMWF, NOAA/NWS and DWD will assist the validation.

# 2.5 Additions to Common Code tables

# 2.5.1 New entry to Common Code Table C-11[⮉](#Cont_2_5)

EUMETNET runs a number of observations data central processing systems. The weather radar processing centre, i.e. the EUMETNET programme OPERA’s Odyssey system, is currently operated by Météo-France and was previously co-hosted with the Met Office.

It plans to further distribute the European radar processing chain across other members of EUMETNET. Code figure 247 is assigned for OPERA as an originating centre to distinguish the above Météo-France products and to allow for other NMHSs to host parts of Odyssey.

The EUMETNET E-Profile programme has developed a system to process data from various upper air profiling instruments (LIDAR, ceilometers, wind-profilers, VAD radar winds) which is hosted by the Met Office. Mr Richard Weedon, UKMO, proposed a new originating centre for E-Profile.

As discussed in item 8.3, the meeting agreed code figure beyond 255 should be assigned, unless the centre will use the existing BUFR templates, which refer to Common Code table C-1. Mr Weedon accepted to assign code figure 290 for E-profile as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_1) to this paragraph. The meeting agreed for FT2019-2 (Cat. 1d) with pre-operational status in accordance with the request by Mr Weedon.

# 2.5.2 New entry to Common Code Table C-5 (FY-2H)[⮉](#Cont_2_5)

FY-2H is the sixth (last) operational satellite of FY-2 geostationary satellite series and was launched successfully on June 5, 2018.

It is equipped with a S-VISSR (stretched visible and infrared spin scan radiometer) for multi-purpose weather satellite imagery, a SEM (space environment monitor), a SXM (solar x-ray monitor) and a DCS (data-collection service). It could provide various kinds of remote sensing products, such as atmospheric motion vectors (AMVs), outgoing longwave radiation (OLR), cloud classification (CLC), precipitation estimation (PRE), sea surface temperature (SST), etc. The AMVs products would be disseminated in BUFR.

Ms Fang Zhao, China Meteorological Administration (CMA), proposed a new entry in Common Code table C-5.

The meeting agreed the proposal without objections for FT2019-2 (Cat. 1d) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_2) to this paragraph.

# 2.5.3 Proposal for new entries in Common Code Tables C-5 and C-8[⮉](#Cont_2_5)

A number of key meteorological satellite launches are foreseen in the coming months. In order to allow the unambiguous representation of data from these missions, additional entries are required in Common Code Tables C-5 and C-8.

Dr Simon Elliott, European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), proposed entries, which have already been shared with the CGMS Task Force on Satellite Data and Codes and accepted.

The meeting agreed the proposal for FT2019-2 (Cat. 1d) without objections as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_3) to this paragraph.

### 2.5.4 Update to XBT Fall Rate Equations (Common Code Table C-3)[⮉](#Cont_2_5)

During the intersessional period, two typographical errors have been detected in the Common Code Table C-3 (Instrument make and type for water temperature profile measurement with fall rate equation coefficients) for Sippican XBT probes T-11 (entry 071) and LMP-5 (entry 900). For probe T-11, a digit has been omitted from coefficient *a*. The incorrect value currently listed is 1.779, whilst the manufacturers value is 1.7779. For probe LMP-5, coefficient *b*is unscaled, whilst it should be scaled by a factor of 1000 to be consistent with the other entries and with Note 1.

Dr David Berry, JCOMM, proposed the above editorial corrections, noting that the fall rate equation coefficients listed in Common Code Table C-3 are for information only and do not require validation. The meeting agreed the proposal for FT2019-2 (Cat. EDT) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_4) to this paragraph.

### 2.5.5 Amendment to Common Table C-14 (for experimental use)[⮉](#Cont_2_5)

It is a common practice, when creating new Code tables for GRIB, to reserve a range of entries for local/experimental use, typically 192-254 for 2 octets. ECMWF has used the local range typically for experimental purpose, i.e. producing new parameters that are not to be exchanged/disseminated yet. These new parameters are eventually requested at the following IPET-CM meetings once tested and validated and are given a proper code in the official range of the relevant table.

Dr Sebastien Villaume, ECMWF, in the above context, proposed a local use range in Common Code table C-14, recognizing that it is not a common practice to have a local range in BUFR Code table. The meeting modified to reflect the use case of ECMWF in the proposal as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_5) to this paragraph and agreed for FT2019-2 (Cat. EDT).

In the process of the discussion, the meeting noticed that Common Code table C-14 is referred also from FM 94 BUFR, which is not specified in the page of list of Common Code tables and it needs to be amended. The meeting noted other Common Code tables may have similar problems, and decided to check and correct them after the meeting and to incorporate corrections as necessary hopefully in the FT2019-2.

### 2.5.6 Editorial changes to Common Code table C-14 – Atmospheric chemical or physical constituent types[⮉](#Cont_2_5)

While preparing a separate proposal with new entries in Common Code table C-14, ECMWF noticed lack of alignment in some entries with terminological best practices of the International Union of Pure and Applied Chemistry (IUPAC). Ms Marijana Crepulja, ECMWF, presented the editorial corrections on behalf of Dr Sebastien Villaume, ECMWF. Dr Villaume confirmed the entry 22 is the only overlap with the previous amendments to Common Code table C-14 in FT2019-1.

The meeting agreed the proposal for FT2019-2 (Cat. EDT) as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_5_6) to this paragraph.

# 2.6 GRIB Edition 3[⮉](#Cont_2_6)

# (none)

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

# [2.7.1](#S2017_2_6_1) Exploring GRIB3 as a Universal Data Representation Binary Code Form[⮉](#Cont_2_6)

Mr Yves Pelletier, TT-BUFR lead, presented a paper, which is summarized in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_2_7_1) to this paragraph, submitted by Mr Tom Kralidis, MSC, Mr Markus Heene, DWD, and himself. Dr Sébastien Villaume, ECMWF, also contributed to the initial validation of the concepts.

Mr Pelletier reviewed the process the TT-BUFR underwent in the past few years regarding BUFR Edition 5, which included requirement gathering and consideration of the significant changes in the data landscape brought about by the Internet, notably the emergence of major industry standard bodies such as ISO and the Open Geospatial Consortium (OGC). In particular, the meeting was reminded that any implementation of the requirement of ISO 19156 compliance for BUFR Edition 5 would bring about significant changes in the data representation method and that this new approach would not be able to make use of existing Table D sequences.

Noting the sensitivity of the perceived need for a change management exercise from current BUFR Edition 4 to Edition 5, especially if a direct approach were used, TT-BUFR noted that BUFR Edition 4 fulfils the basic requirements for the exchange of SYNOP, TEMP and CLIMAT data as implemented under the Migration to Table-Driven Code Forms. Therefore, the current BUFR edition could in principle continue to meet current operational requirements for data exchange, while BUFR Edition 5 is being devised and tested with the goal of meeting emerging needs. This will allow for a flexible introduction of BUFR Edition 5 into operational usage as a solution to new WMO requirements, and for innovative approaches to be contemplated in the development of BUFR Edition 5. Finally, TT-BUFR noted that it approaches the design of BUFR Edition 5 with operational goals in mind. This includes goals of resource efficiency and economical software development and maintenance.

With this in mind, the paper provides an early exploration of the potential of GRIB Edition 3 (GRIB3), to encode data traditionally provided in BUFR. It is suggested that the ISO 19156 compliant binary container provided by GRIB3 could provide the universal data representation framework that is currently offered separately by the BUFR code form.

In order to provide a practical example, the paper describes three separate options whereby GRIB3 could be used to represent data from a canonical moving instrument package, similar to a radiosonde. TT-BUFR proposed to continue further exploration of this avenue with other data types to identify and address any issues and gain experience in the representation of non-gridded data in GRIB3.

The meeting agreed that the approach should be further investigated. EUMETSAT and ECMWF expressed interest in participating in the investigation, noting that data from space-borne instruments is another major use case that can be used to develop and test the scope of data representation in GRIB3. In the coming year, TT-BUFR will produce data samples and document its experience in using GRIB3, on an experimental basis, to encode datasets traditionally represented in BUFR.

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

(none)

# 4. MANUAL ON CODES: TRADITIONAL ALPHANUMERIC CODES

### 4.1 Alignment of the WMO Manual on Codes regarding the representation of midnight in OPMET information, including TAF, plus other relevant considerations[⮉](#Cont_4)

In METAR/SPECI, midnight is always represented by 0000Z, whereas in TAF midnight could be represented either by 0000Z or 2400Z, depending on whether midnight denotes the start or the end of the TAF validity period (or intervening TAF validity periods).

According to ICAO Annex 5 (*Units of Measurement to be used in Air and Ground Operations*), Attachment E, paragraph 3 (Presentation of time), hours should be represented by two digits from 00 to 23 in the 24-hour timekeeping system. Moreover, the International Organization for Standardization (ISO) 8601 does not permit the use of “24” to represent midnight.

The feedback from airline users is that the use of “24” instead of the “00” notation is unnecessarily confusing, impacting especially in the flight planning area and en-route MET information update processes. The successful implementation of ICAO meteorological information exchange model (IWXXM) and system-wide information management (SWIM) depends on the correct use of standards.

In view of the above, ICAO invited the meeting to agree that there is a need to explicitly state this consistent time depiction of midnight using the “00” notation in WMO-No. 306, Manual on Codes.

As part of Amendment 76 to Annex 3/WMO-No 49, Volume II, applicable in November 2013, in automated METAR and SPECI, the coding of missing information in the cloud layers associated to cumulonimbus (CB) or towering cumulus (TCU) was simplified with the transition from the use of six (6) solidi to three (3) solidi.

Following the consultation process of Amendment 78 to Annex 3 (applicable in November 2018) and during the final review, it was suggested to replace, in Table A3-2 of ICAO Annex 3, the example “//////CB” by “///CB’ which was endorsed by the Air Navigation Commission (ANC) of ICAO. But, it was omitted in Amendment 78.

In view of the urgent need to correct the referred omission, a corrected example was included in Corrigendum No. 1 to Annex 3, Twentieth Edition, issued on 30 November 2018.

In view of the above initiatives in ICAO, ICAO requested to align the regulations in Manual on Codes (WMO-No. 306) with those in ICAO Annex 3.

The meeting recognized the requirements and had a concern on impact to applications. The meeting therefore decided to request the Task Team on Aviation Coding Issues (TT-AvCI) to draft the amendments to the Manual on Codes with analysis on potential problems by the end of this year, which will be shared with IPET-CM. The draft will be sent to ICAO for consultation and, when agreed, forwarded to an appropriate procedure for adoption in consideration of the impact and WMO Constituent Body Reform.

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

(none)

# 6. SUMMARY AND CONCLUSION OF PROPOSALS

### 6.1 Summary of amendments since IPET-CM-II and update of status of validation[⮉](#Cont_6)

In accordance with the *Procedures for amending WMO Manuals and Guides that are the responsibility of the Commission for Basic Systems* ([Res. 12 (EC-LXVIII)](http://www.wmo.int/pages/prog/www/ISS/Meetings/IPET-CM_Offenbach2018/References/4-EC_LXVIII_2016_RES12_WMOPres-TechSpec_20160624.pdf)), 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 1st meeting of IPET-CM as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_6_1a) to this paragraph.

Furthermore, the meeting confirmed status of the proposals, which have already been approved for validation, on amendments to the Manual on Codes one by one as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_6_1b) to this paragraph.

### 6.2 Conclusion on intersessional discussion (in lieu of PFC)

### 6.2.1 [⮉](#Cont_6)

# 7. MIGRATION TO TABLE-DRIVEN CODE FORMS

### 7.1 Comparison of number of reports received in TDCF and TAC during January 2019[⮉](#Cont_7_1)

The Special Main Telecommunication Network Monitoring (SMM) is carried out four times a year. This report is based on the results from the monitoring period 1-15 January 2019. The values quoted in this document are based on the information in the SMM processed files.

The SMM records all messages containing observations for stations in the RBSN and RBCN that pass through participating Regional Telecommunications Hubs (RTHs) on MTN. The summaries produced by these RTHs are sent to processing centres that produce lists of the times for which observations were available during the monitoring period.

The tables, which is in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_1) to this paragraph, compare the percentage of required reports received from stations in TDCF and in TAC broken down by WMO Region (four reports a day are required from surface stations, two are required from upper-air stations).

In the tables 3 and 4, circled areas suggest that there may be issues where bulletins are not transiting to the RTH or not received from RTHs. There the availability of TAC is 90-100%, while that of TDCF is 0%. This may be confirmed by the regional reports in the agenda item 7.2. Inconsistencies were noted with other data sources.

The meeting requested the Secretariat to share the issues identified with regional representatives and also requested to investigate the issues identified in the monitoring results.

# 7.2 Reports by members on status of migration

### 7.2.1 Status of migration to TDCF in RA I[⮉](#Cont_7_2)

Mr Hassan Haddouch, Regional Representative of RA-I, Maroc Météo, presented his report on migration to Table-Driven Code Forms (TDCF) in RA-I.

Mr Haddouch conducted a survey in the region to understand the situation on the TDCF Migration process in RA-I, the result of which is summarized in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_1) to this paragraph.

Mr Haddouch highlighted that even after undergoing training and appreciating the importance of TDCF in most of RA-I countries, several Members are still unable to proceed with the migration due to lack of capacity to implement TDCF processing systems.

Use of telecommunication only capable of handling TAC data exchanges would more affected the result. Transfer of TDCF messages requires upgrading to more advanced means such as FTP. Some have implemented CLIMSOFT which can encode observations into TDCF but so far they have not been able to transmit the produced BUFR files to the responsible RTHs due to the same reasons. It is the case of Uganda, Burundi and Malawi.

GISC Casablanca has already contacted many of the centres in the Annex to discuss the various possible means to connect their centres with GISC Casablanca. Most connections will pass through the internet (Capo Verde, Guinea, Senegal), while some others will be connected via the RMDCN network (Exp: Tunisia).

Mr Haddouch recommended:

• GISC Casablanca and Pretoria should be encouraged to play a guiding role in identifying the suitable connectivity means that can be easily implemented for TDCF data exchange in their area of responsibility.

• TAC-TDCF converters be implemented in the existing message switching systems as a transition step before a full migration.

• Retraining in RA-I will help to achieve the TDCF migration.

The meeting thanked Mr Haddouch for his efforts for the migration to complete and consideration from telecommunication aspect on migration issues identified. The meeting requested the Secretariat to investigate resource for training events (also see item 9.4).

### 7.2.2 Status of migration to TDCF in RA II[⮉](#Cont_7_2)

Following the decisions of the sixteenth session of Regional Association II (Abu Dhabi, 12-16 February, 2017), the RA-II Management Group defined working structures and the terms of reference of Working Groups and Leaders. The Leader in 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, Ms Jitsuko Hasegawa, regional representative of RA-II and the Leader, has monitored and given technical assistance as well as has conducted survey on migration status on a regular basis. Ms Hasegawa presented the results of survey as of January 2019 and summarized the related activities by RA-II Members during the period between July 2018 and January 2019 are in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_2) to this paragraph.

Ms Hasegawa pointed out that there had not been a significant progress since 2014 in the Region's migration status, although the rate of stations that report BUFR bulletins was not low compared to other Regions. She also pointed out that one of the achievements of the Region was that most of the GISCs had well established communication channels with National Centres in their Area of Responsibility and most of the telecommunication issues had been solved thanks to the communication.

The meeting thanked Ms Hasegawa for her leading role in Region II for monitoring the status and assisting the migration to TDCF.

### 7.2.3 Status of migration to TDCF in RA-III[⮉](#Cont_7_2)

Dr Sergio Henrique Soares Ferreira, INPE/Centro de Previsão de Tempo e Estudos Climáticos (CPTEC), presented the report on migration to TDCF in Region III, prepared by Mr Luis Arturo Lazcano Guerrero, Regional Representative of RA-III. It contains information sent by the BUFR focal points of the RA-III countries (survey), but much information has been obtained from the WIS portals of Argentina and Brazil as a normal user (other sources), which are as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_3a) to this paragraph.

Mr Lazcano Guerrero emphasized in the document that the biggest problem in RA-III was the contact with the focal points of the countries, which has made it difficult to obtain data for a more detailed analysis.

Dr Ferreira, INPE/CPTEC, presented his document to supplement the information provided by Mr Lazcano Guerrero.

Dr Ferreira highlighted that his report was based mainly on the analysis of GTS data in RA-III, received at INPE/CPTEC through GISC Brasilia in January 2019. The summary of his presentation is as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_3b) to this paragraph.

With regard to the wrong originating centre, Mr Pelletier, MSC, will contact Colombia to correct the code (currently 54 Montreal RSMC).

The meeting thanked to Mr Lazcano Guerrero and Dr Ferreira for their efforts to identify issues on migration to TDCF in Region III.

### 7.2.4 Status of migration to TDCF in RA IV[⮉](#Cont_7_2)

WMO Regional Association IV (North America, Central America and the Caribbean) consists of twenty-seven (27) Members, five of which are also Members of other Regional Associations. One of its Members, the British Caribbean Territories, consists of Anguilla, the British Virgin Islands, the Cayman Islands, Montserrat and the Turks and Caicos Islands. Further, there are three (3) countries, which are not WMO Members, but transmit their synoptic observations via the WMO Information System in RA-IV.

Mr Glendell De Souza, Regional Representative from RA-IV, British Caribbean Territory, conducted a survey in November 2018 to ascertain how many Members had transitioned their synoptic observations from traditional alphanumeric codes (SYNOP, TEMP and CLIMAT) to Binary Universal Form of Representation (BUFR). The result is summarized in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_4) to this paragraph.

Four out of 11 Members are disseminating TDCF bulletins to GTS. Mr De Souza emphasized the main obstacle for the migration is unavailable encoding/decoding software.

The Secretariat asked Mr Glendell to let the Secretariat know if and when RA-IV will need training or something. Mr Pelletier mentioned that the Canadian software could be compiled into MS Windows. ECMWF invited Mr De Souza to contact Ms Marijana Crepulja of ECMWF for user support to their software, which is also available under MS Windows.

The meeting thanked Mr De Souza for his efforts on the migration to TDCF in RA-IV, which he has been made so far.

### 7.2.5 Status of migration to TDCF in RA V[⮉](#Cont_7_2)

The report on migration to TDCF in Region V, prepared by Dr Weiqing Qu, Regional Representative of RA-V, Bureau of Meteorology, was presented to the meeting. Dr Qu conducted a survey in April 2019 to collect the information on migration to TDCF in the region, the result of which is as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_5) to this paragraph.

Dr Qu stated in the document that GISC Melbourne will continue to monitor the status of TDCF migration in RA-V and liaise with the countries to identify issues in relation to the migration, including the BUFR upper-air issues of missing data and wrongly coded data, as are being raised in the GISC ticketing system.

The meeting thanked Dr Qu for his efforts for monitoring of and continuing support to the migration to TDCF in the region, for example, through active participation in the problem management for upper-air BUFR reports.

### 7.2.6 Status of migration to TDCF in RA VI[⮉](#Cont_7_2)

The document on migration to TDCF in RA-Vi, prepared by Dr Sergey Belov, Regional Representative of RA-VI, Russian Federation, was presented to the meeting.

The status of migration in Region VI is summarized in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_6) to this paragraph.

In relation to the report, the meeting had a talk about an issue of conversion to TAC. It was felt that it is required in some specific case but there is a risk of erroneous conversion, in particular, by other centres than that of the original BUFR message.

Dr Belov emphasized that most counties of the region have to provide their actual status report on production and distribution of the TEMP and CLIMAT data following *MTDCF Questionnaire or any other means.*

The meeting thanked Dr Belov for his efforts, also as the co-leader of RA-VI Task Team on WIS, to the migration to TDCF in Region VI.

### 7.2.7 Status of migration to TDCF in JCOMM[⮉](#Cont_7_2)

Dr David Berry, Representative of JCOMM, presented remotely his document on migration to TDCF in JCOMM. The list of previously used TAC forms and their BUFR replacements are shown in Table 1 and the format and spatial distribution of VOS observations on the GTS in 2019 is in Figure 1 as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_7_2_7) to this paragraph.

Dr Berry explained that:

• migration to BUFR for E-ASAP observations was completed in 2016,

• the distribution of TAC messages for Argo profiling float observations ceased in July 2018,

• during January 2019 the majority of VOS observations were distributed in parallel in both TAC and BUFR (see Figure 1),

• Based on receipts at JCOMMOPS during March 2018, 100% of drifting buoys were reporting in BUFR with a small percentage (5%) reporting in both TAC and BUFR,

• As reported at the 34th Session of the Data Buoy Cooperation Panel [[1]](https://www.jcomm.info/components/com_oe/oe.php?task=download&id=40817&version=1.0&lang=1&format=1), 41% of moored buoys reported in BUFR or BUFR and TAC,

• At the 10th Session of the JCOMM Ship Observations Team it was reported that the migration of the BATHY (XBT) data could be considered complete [[2]](https://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=23894).

The meeting thanked Dr Berry for his sustainable inputs on and efforts for the migration to TDCF in JCOMM.

### 7.3 Issues management process for upper air BUFR reports[⮉](#Cont_7_2)

The team was informed about the issue management process for upper air BUFR reports, which was initiated by a letter sent out in November 2018 to all the WMO Members, based on the agreement of the Task Team on the Global Information System Centres (TT-GISC) at its meeting in Casablanca, September 2018. Issues of upper air BUFR reports identified mainly by NWP centres are recorded and tracked by GISCs using a web-based system operated by GISC Brasilia, on a same platform that is used for GISC Watch. At the time when the document was written there were 46 issues related to BUFR upper air problems in the tracking system, two of them had been resolved and some of them have a resolution in progress. A comment was made about the WIGOS Data Quality Monitoring System, that the System is trying to establish a similar mechanism for more types of data under the framework of WIGOS (see item 10.1).

The meeting requested ET-WISC/TT-GISC to make the web-based system accessible to the members of IPET-CM.

# 8. ADMINISTRATIVE ISSUES

### 8.1 Category of amendments[⮉](#Cont_8)

The Category of Amendments (CA, hereunder) was initially submitted to the second meeting of IPET-CM, Offenbach, Germany, 2018. It is to categorize amendments to the Manuals on Codes (WMO-No. 306) and the GTS (WMO-No. 386) to facilitate approval of amendments, in particular, by the procedures for fast-track and adoption between CBS sessions.

It has been actually of great help for evaluating impact of the proposals and could have been referred (although not directly to the alphanumeric categories, such as 1a or 1b) during the procedures for fast-track and adoption between CBS sessions.

In the experimental use, it was felt that the factor, *data production tasked to specific centres (b)*, was a little confusing in view of the WMO legal framework. Initially, it intended to cover data productions by RSMCs with activity specialization and international organizations. However, if a data production is within the tasks of an international organization, provision of the data to WMO Members is voluntary from WMO's perspective. If the organization produces the data within the tasks assigned to the organization by WMO, such as an RSMC with activity specialization, it is data provision as an RSMC.

Accordingly, the factor was split into two, i.e. WMO special standard practice (b) and voluntary data production (d), which is the only major change in the updated CA. Other texts in the document were adjusted editorially.

The meeting noted the change in the updated CA and agreed that the updated CA will be still experimental but further use should be pursued within CBS for adoption of amendments by the chairperson of OPAG-ISS and the president of CBS, referring to the alphanumeric category, such as 1a and 1d, based on the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_8_1) to this paragraph.

### 8.2 Development of Reporting Practices[⮉](#Cont_8)

Reporting practices (RPs) are specified in Manual on Codes, Volume I.1 (WMO-No. 306) for observations, forecasts, analyses and statistics (data productions in total) in traditional alphanumeric codes (TAC). The RPs are extended to the table-driven code forms (TDCF) as specified in section d, Manual on Codes, Volume I.2 for specific traditional observations, i.e. land and sea surface, upper-air and climatological observations, which are referred to as B/C Regulations.

CBS-16 adopted "Ceasing maintenance of traditional alphanumeric codes" (Rec. 10 (CBS-16)), which was confirmed by EC (Decision 38 (EC-69)). Volume I.1 will cease its role as an official manual at an appropriate future time after the migration to TDCF is completed and will be kept for archives.

It is expected that the development of new RPs will require a long process in association with other technical commissions. Therefore, it must be difficult to introduce RPs on a timely manner, if the action to develop RPs is not initiated well in advance.

In addition to the risk of missing reporting practices, their modernization and those for advanced observations will also be a main subject for consideration.

In consideration of the above points, it was suggested that the issue of development of reporting practices is to be raised to a responsible technical commission. If agreed, the responsible commission will collect requirements from the other and within the responsible commission.

The meeting agreed with the suggestion, recognizing any details and procedures toward publication of RPs will be discussed once the initiative has been authorized by the responsible commission.

### 8.3 Common Code tables C-1 and C-11[⮉](#Cont_8)

In view of the definitions, Common Code table C-1 should not be referred to by FM 92 GRIB Edition 2 and FM 94 BUFR Edition 4. However, several sequences in BUFR Table D actually refer to C-1 through the element descriptor 0 01 033. It is therefore proposed as a remedy that this contradiction should be resolved in the manner not to impact existing BUFR messages.

On the other hand, it was recommended to use C-11 through the element descriptor 0 01 035 instead. Since C-1 is being saturated (about 20 code figures remain), it was also recommended to assign code figure beyond 255 unless the centre will use sequences of BUFR that refer to C-1.

The meeting agreed the amendment to the definition of Common Code table C-1 as in the [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_8_3) to this paragraph for FT2019-2 (EDT) together with editorial adjustment to the name of 0 01 035 to "Originating/generating centre".

The meeting also accepted the recommendations for use of C-11 and assigning code figure beyond 255 as reminders for IPET-CM itself.

### 8.4 Use of GitHub as collaboration tool for IPET-CM[⮉](#Cont_8)

Dr Enrico Fucile, WMO Secretariat, showed the team the GitHub space that has been made available by the Secretariat for the teams working on information management <https://github.com/wmo-im>. The platform provides a convenient tool for collaborative work and is already used by several other teams effectively. The introduction of the tool to maintain a master copy of the GRIB and BUFR tables and to manage new proposals is planned for the end of the year and the Secretariat is going to coordinate the registration of the members of the team and support a familiarization process with the tool. GitHub is going to be used by the team as a tool for the management of the tables and the issues around them, but is not a publication tool. Publication of the tables will still go by the current means and is not going to change in the future.

The meeting discussed the use of GitHub and its implications. The meeting requested the Secretariat to let IPET-CM know whether the use of GitHub is officially authorized.

### 8.5 #VocabularyManager: A tool for managing BUFR tables[⮉](#Cont_8)

The meeting was informed about a tool #VocabularyManager, developed and used by EUMETSAT to manage tables of WMO’s table-driven code forms in an efficient and reliable way and to provide a single source of “canonical” BUFR tables for various uses at EUMETSAT. The tool is format independent and has various features including import and export capabilities, integrity check, element creation guidance and table version comparison. The meeting was informed that EUMETSAT was ready to consider exposing an instance to public through internet so that other Centres could download tables in their format of choice, and to explore the possibility to provide source codes with organizations, if there are such requirements. Regarding the first offer of EUMETSAT, the meeting indicated that it would be glad to see the tool made available for internet access. In connection to the second offer, the WMO Secretariat asked if the tool could be extended to be able to import WMO’s CSV format tables so that they could export the XML version from that, and it was indicated that EUMETSAT would consider this request positively.

# 9. IPET-CM AND TASK TEAMS

### 9.1 Implications for the further Re-Architecting of coding formats[⮉](#Cont_9)

Mr. Richard Weedon, UK Met Office, presented the paper which described concerns raised by UK Met Office over development of a new edition of BUFR, and requested the reevaluation of the requirements of BUFR edition 5. Firstly the paper outlined the risk of increasing overheads that would be caused by the implementation of a new architecture, which would be added to those already experienced from delays in existing transformation projects: TDCF migration, development of IWXXM and WIGOS identifiers to name but a few.

The next point made was that the original requirement for greater interoperability with other data coding standards (NetCDF/HDF5) would be provided through the development of WIS 2.0 and could therefore be removed.

In responding to the requests made by UK Met Office, the meeting confirmed that BUFR Edition 4 and GRIB Edition 2 would continue to be used within operational meteorology for a long time, there still was the requirement for interoperability with other code formats, and the meeting welcomed to work together with IPET-DD in the development of the new BUFR edition.

### 9.2       Discussion on future ToR of the team responsible for coding issues

The meeting agreed to add an item to its future ToR, regarding the proposal on the development of reporting practices under agenda item 8.2. The team will play a coordination role in the development of reporting practices by all WMO Programmes, by establishing a mechanism for all parties involved to document and maintain reporting practices as part of WMO’s regulatory materials.

### 9.3       Task Team on Aviation Coding Issues (TT-AvCI)

The Task Team confirmed that, as an action item, it would draft amendments of the Manual on Codes (METAR/SPECI and TAF) based on the request of ICAO (see item 4.1) and conduct a gap analysis.

The request was made by the Secretariat that TT-AvCI should take a more direct approach in the process of ensuring amendments of ICAO Annex 3 are integrated into the Manual on Codes. Noting changes in the workflow between the respective Secretariats of the WMO and ICAO, the meeting recognized that the TT-AvCI needs to undertake the required actions related to the Manual on Codes on the basis of proactive interaction with ICAO Working Groups, in order to maintain a coordinated approach in keeping both regulatory materials up-to-date and consistent. The meeting decided to ask Task Team members who are also members of ICAO Working Group on Meteorological Information Exchange (WG-MIE) of the Meteorology Panel (METP) to play a role of interface between both working groups, and to take necessary actions triggered by the activities of WG-MIE.

### 9.4 Task Team on Migration to TDCF (TT-MTDCF)

The meeting highlighted some points that were raised by the reports of Regional Representatives to IPET-CM: 1) in some Regions, there is still a need for training on TDCF, within a context of overall WMO Information System (WIS) implementation, 2) in some Regions, issues of TDCF migration cannot be separated from telecommunication issues and the community needs to address both aspects, and 3) it might make sense to arrange a regional workshop inviting the Regional Representatives to IPET-CM and relevant focal points of Members in the region that are experiencing difficulties in the TDCF migration leaving the door open for additional participation as necessary. The meeting requested the Secretariat to coordinate with the regional department (DRA) for possible arrangements of such workshop.

The meeting discussed the activities on MTDCF and agreed on general points: 1) the community needs to continue to work on this, focusing on the context of WMO Members’ compliance to its Technical Regulations, which is broader than the migration to TDCF,  2) the designation of the Regional Representatives was an important step forward to have a better understanding of the situation and requirements in each Region in assisting Members to achieve the goal, and 3) there is a need to enhance the involvement of Regional Offices of the Secretariat to assist Regional Representatives in playing a larger role than the status monitoring in achieving the goal of MTDCF.

# 10. COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES

### 10.1 Task Team on the WIGOS Data Quality Monitoring System (TT-WDQMS)[⮉](#Cont_10)

Mr. Jeffrey Ator, a member of the Task Team on the WIGOS Data Quality Monitoring System (TT-WDQMS), summarized the activities of the Task Team. The System is envisioned to consist of three component functions: monitoring, evaluation and incident management. The prototype of monitoring function is implemented as a web-based tool to monitor the timeliness and quality of three types of observations received by four global NWP centres. The Task Team is hoping to leverage, in addition to the monitoring system for aircraft data by Inter-programme Expert Team on Aircraft-Based Observations (IPET-ABO), other real-time monitoring resources that have already be established, such as the ones for marine data by JCOMM, for air quality data by GAW and for satellite products by EUMESAT's NWP SAF. The Task Team welcomes any advice or assistance from IPET-CM in identifying suitable point of contact and other potential groups with which the Task Team could collaborate.

As discussed at the last meeting of IPET-CM, the WDQMS evaluation function is envisioned to be housed at one or more Global WIGOS Centers (GWCs), which would take as input any specific issues noted by the monitoring function and determine if further action was needed.  If so, it would then be assigned a tracking number and referred to the WDQMS incident management function for resolution.  The incident management function would be housed at Regional WIGOS Centers (RWCs) within each of the WMO regions, in many of which progress has already been made towards the establishment of an RWC. IPET-CM was also asked to assist in encouraging all WMO Member countries to keep their national metadata up-to-date within OSCAR/Surface, which is used as a baseline of WDQMS evaluation function not only for physical location, but also for expected timeliness and frequency of reports from all observing sites.

WMO Secretariat agreed to arrange coordination between TT-WDQMS and TT-GISC to avoid duplication in efforts (see item 7.3).

### 10.2 WMO Programmes needs for CF conventions[⮉](#Cont_10)

Dr Enrico Fucile, WMO Secretariat, presented the outcome of IPET-DD first meeting held in Zagreb, Croatia in March in relation to the needs for netCDF and CF conventions by some WMO Programmes. There were documents and presentations by the Chair of the Inter-Programme Expert Team on Operational Weather Radar (IPET-OWR), a representative for the Global Cryosphere Watch (GCW) programme, EUMETSAT for the satellite programmes, ECMWF for the NWP community. All the presentations were in agreement that netCDF is a widely used format, that the CF convention provides some standardization, but not enough for the needs of WMO Programmes (see [**Annex**](Report_IPET-CM-III_Marrakech_annex.docx#A2019_10_2) to this paragraph).

The meeting was informed that IPET-DD proposed to WMO Secretariat to organise a workshop on “CF conventions in WMO Programmes” to bring together experts from WMO data representation and programmes activities and the CF communities with the aim to establish possible collaboration for the development of CF profiles for the use in WMO Programmes.

Dr Simon Elliott, EUMETSAT, recalled that as early as 2008 the WMO Expert Team on Assessment of Data Representation Systems (ET-ADRS)[[1]](#footnote-1) noted that WMO should be engaged in the governance of CF Conventions and it agreed:

· on a coordination mechanism to drive forward the NetCDF format (e.g. enhanced packing/compression) and the CF metadata standards to be fit for operational meteorology (WMO requirement);

· to consider the question of the resources (e.g. at NMHS level) required to support the data format and metadata standard development;

· to develop a model for the governance.

The meeting discussed the opportunity to engage with the CF community. The meeting supported the initiative of having a workshop proposed by IPET-DD to decide the governance needed for eventual WMO CF profile\*.

\* Clear definition will be needed.

# 11. CLOSURE OF THE MEETING

The meeting was closed at 16:15 on Friday 19 April 2019.

* **ANNEX TO PARAGRAPH 1.2**[**⮉**](#S2019_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** |
| **4** | **MANUAL ON CODES: TRADITIONAL ALPHANUMERIC CODES** |
| 4.1 | Alignment of the WMO Manual on Codes regarding the representation of midnight in OPMET information, including TAF, plus other relevant considerations |
| **5** | **MANUAL ON GTS: DATA DESIGNATOR** |
| **6** | **SUMMARY AND CONCLUSION OF PROPOSALS** |
| 6.1 | Summary of amendments since IPET-CM-II and update of status of validation |
| 6.2 | Conclusion on intersessional discussion (in lieu of PFC) |
| **7** | **MIGRATION TO TABLE-DRIVEN CODE FORMS** |
| 7.1 | Comparison of number of reports received in TDCF and TAC during January   2019 |
| 7.2 | Reports on status of migration by representatives from RAs and TCs |
| 7.3 | Issues management process for upper air BUFR reports |
| **8** | **ADMINISTRATIVE ISSUES** |
| 8.1 | Update of Category of Amendments |
| 8.2 | Development of reporting practices |
| 8.3 | Common Code tables C-1 and C-11 |
| 8.4 | Use of GitHub as collaboration tool for IPET-CM |
| 8.5 | VocabularyManager: A tool for managing BUFR tables |
| **9** | **IPET-CM AND TASK TEAMS** |
| 9.1 | Implications for the further re-architecting of coding formats |
| **10** | **COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES** |
| 10.1 | Task Team on the WIGOS Data Quality Monitoring System (TT-WDQMS) |
| 10.2 | WMO Programmes needs for CF conventions |
| **11** | **CLOSURE OF THE MEETING** |
|  |  |

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

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

(MARRAKECH, MOROCCO, 15 - 19 APRIL 2019)[**⮉**](#S2019_1_2)

**LIST OF PARTICIPANTS**

**CHAIRPERSON:**

JAPAN Ms Jitsuko HASEGAWA

Japan Meteorological Agency

1-3-4, Otemachi

Chiyoda-ku

TOKYO 100-8122

Japan

Tel.: +81 3 3212 8341 (ext. 2262)

Fax: +81 3 3211 2032

E-mail: [j-hasegawa@met.kishou.go.jp](mailto:j-hasegawa@met.kishou.go.jp)

[jitsukoh@gmail.com](file:///C:\Users\Autologon\AppData\Local\Temp\jitsukoh@gmail.com)

**CO-CHAIRPERSON:**

CANADA Mr Yves PELLETIER

Centre Météorologique Canadien (CMC)

Meteorological Service of Canada (MSC)

2121 Voie de Service Nord

DORVAL, Quebec H9P 1J3

Canada

Tel.: +1 514 421 4662

Fax: +1 514 421 4679

E-mail: [yves.pelletier@ec.gc.ca](mailto:yves.pelletier@ec.gc.ca)

**MEMBERS OF IPET-CM:**

BRAZIL Dr Sergio Henrique Soares FERREIRA

Centro de Previsao de Tempo e Estudos Climaticos (CPTEC)/INPE   
 Rodovia Presidente Dutra Km 39  
 CACHOEIRA PAOLISTA, SP   
 Brazil  
 Tel: +55 (12) 3208-7962  
 Fax: +55 (12) 3101-2835  
 Email: [sergio.ferreira@inpe.br](mailto:sergio.ferreira@inpe.br)

CHINA Ms Fang ZHAO

China Meteorological Administration

46 Zhongguancun Nandajie

BEIJING 100081

China

Tel.: +86 10 6840 7095

Fax: +86 10 6217 3225

E-mail: [zhaof@cma.gov.cn](mailto:zhaof@cma.gov.cn)

ECMWF Ms Marijana CREPULJA

ECMWF

Shinfield Park

READING, RG2 9AX

United Kingdom

E-mail: Marijana.Crepulja@ecmwf.int

EUMETSAT Dr Simon ELLIOTT

EUMETSAT

EUMETSAT-ALLEE 1,

D-64295 DARMSTADT

Germany

Tel.: +49 6151 8073850

Fax: +49 6151 8074260

E-mail: [simon.elliott@eumetsat.int](mailto:simon.elliott@eumetsat.int)

GERMANY Ms Sibylle KREBBER

Deutscher Wetterdienst

Frankfurterstrasse 135

D-63067 OFFENBACH

Germany

Tel.: +49 69 8062 2647

Fax: +49 69 8062 3829

E-mail: [sibylle.krebber@dwd.de](mailto:sibylle.krebber@dwd.de)

MOROCCO Mr Abderrazak LEMKHENTER

Direction de la Météorologie Nationale, CNME/SMM   
 B.P. 8106 en face de la prefecture Hay Hassani  
 CASABLANCA   
 Morocco  
 Tel: +212 5 22 91 38 03/05  
 Fax: +212 5 22 91 37 97  
 Email: [lemkhenter@gmail.com](mailto:lemkhenter@gmail.com)

UNITED KINGDOM Mr Richard WEEDON

Met Office

Fitzroy Road

EXETER, DEVON

United Kingdom

Tel.: +44 1392 884518

E-mail: [richard.weedon@metoffice.gov.uk](mailto:richard.weedon@metoffice.gov.uk)

UNITED STATES OF AMERICA Mr Jeffrey ATOR

NOAA/NWS  
 W/NP1

5830 University Research Ct.

College Park, MD 20740

United States of America

Tel:  [+1 301 683 3912](tel:%2B1%20301%20683%203912)

E-mail: [jeff.ator@noaa.gov](mailto:jeff.ator@noaa.gov)

**INTERNATIONAL ORGANIZATIONS:**

ECMWF (REMOTELY) Dr Sebastien VILLAUME

ECMWF

Shinfield Park

READING, RG2 9AX

United Kingdom

E-mail: sebastien.villaume@ecmwf.int

**TECHNICAL COMMISSIONS:**

JCOMM (REMOTELY) Dr David BERRY

National Oceanography Centre,  
 University of Southampton Waterfront Campus,  
 European Way, SOUTHAMPTON, SO14 3ZH, UK

Tel: +44 23 8059 7740

Fax: +44 23 8059 6400

E-mail: [dyb@noc.ac.uk](mailto:dyb@noc.ac.uk)

**REGIONAL ASSOCIATIONS:**

RA-I Mr Hassan HADDOUCH  
 Department of National Meteorology of Morocco   
 Face Préfecture Hay Hassani, B.P. 8106 Casa-Oasis,   
 Casablanca  
 Fax: +212522913435  
 E-mail: [haddouchh@yahoo.com](mailto:haddouchh@yahoo.com)

RA-IV (REMOTELY) Mr Glendell DE SOUZA

Caribbean Meteorological Organization   
 27 O'Connor Street, Woodbrook, P.O. Box 461,   
 Port-of-Spain   
 Tel: +1 868 7353681  
 Fax: +(1 868) 622 0277  
 Mobile: +1 868 7353681  
 Email: [GDe\_Souza@cmo.org.tt](mailto:GDe_Souza@cmo.org.tt)

**OTHERS:**

CANADA (REMOTELY) Mr Tom Kralidis

Meteorological Service of Canada (MSC)

10 Wellington Street, 4th FloorNorth TowerLes Terrasses de la Chaudière

K1A 0H3

GATINEAU

Email: tom.kralidis@canada.ca

**WMO SECRETARIAT:**

Dr Enrico Fucile

7 bis avenue de la Paix

Case postale 2300

1211 GENEVE 2

Switzerland

Tel.: + (41 22) 730

Fax: + (41 22) 730 8021

Email: [EFucile@wmo.int](mailto:EFucile@wmo.int)

Mr Atsushi SHIMAZAKI

7 bis avenue de la Paix

Case postale 2300

1211 GENEVE 2

Switzerland

Tel.: + (41 22) 730 8313

Fax: + (41 22) 730 8021

Email: [AShimazaki@wmo.int](mailto:AShimazaki@wmo.int)

1. <https://www.wmo.int/pages/prog/www/WDM/ET-ADRS-1/ET-ADRS-1_draft_report_v7.doc> [↑](#footnote-ref-1)