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| WORLD METEOROLOGICAL ORGANIZATION  COMMISSION FOR BASIC SYSTEMS  -----------------------------  FIRST MEETING OF  INTER-PROGRAMME EXPERT TEAM ON CODES MAINTENANCE  GENEVA, SWITZERLAND, 24 - 28 JULY 2017 |  | IPET-CM-I / Doc. 2.4 (4)  (12. 07. 2017)  -------------------------  ITEM 2.4  ENGLISH ONLY |

BUFR/CREX templates

**BUFR template for surface observations from n-minute period**

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**Summary and Purpose of Document**

This document proposes to introduce changes and amendments to   
TM307092 for n-minute AWS data reporting.

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**ACTION PROPOSED**

The meeting is requested to review and approve the contents for validation and inclusion within the May 2018 fast-track (FT2018-1) update to the WMO Manual on Codes.

**DISCUSSION**

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, which can be used in global applications and by promoting the global exchange of even sub-hourly data in support of relevant application areas. Two actions have been defined in the EGOS-IP to achieve these goals:

• Action G2: Ensure, as far as possible, a global exchange of hourly data, which are used in global applications, optimized to balance user requirements against technical and financial limitations.

• Action G3: Promote a global exchange of sub-hourly data in support of relevant application areas.

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.

EUMETNET Members considered the use of BUFR template for n-minute AWS data (TM307092) which hasn´t been validated so far, but identified that for several parameters the provided information doesn´t seem to be sufficient for European use. Hence, EUMETNET amended TM307092 according to their needs. These amendments are proposed to IPET-CM.

TM307092 has a long history:

* Proposed 2007 at ET-DR&C (s. Paragraph 3.1.6) by Eva Červená as “*AWS BUFR template for surface observations from n-minute period with national and WMO station identification*” for further validation and development. The templated based on requirement from ET-AWS (Expert Team on Requirements and Implementation AWS Platforms)
* Slightly reviewed in 2008
* IPET-DRC-III 2011 in Melbourne: Revision UK-met and Eva Červená
* IPET-DRC-IV 2012 in Exeter: New version proposed by Eva Červená considered requirements form ET-AWS-7 meeting
* IPET-DRMM-I 2013 Tokyo: addition of more meta data (Sequence 301130 added)
* IPET-DRMM-II 2014 College Park: Richard Weedon requested pre-operational status but revalidation was recommended.

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**PROPOSAL**

**(1) Amend the BUFR template for n-minute AWS data (TM307092) the following:**

As a result of a survey among EUMETNET Members concerning sub-hourly AWS data reporting early this year only a minimum set of metadata should be integrated in the template to be send with each sub-hourly message. It was decided to consider OSCAR/Surface as official metadata source instead.

Therefore, a lot of metadata were removed from the template again.

**TM 307092 - BUFR template for surface observations from n-minute period**

Expands as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Station identification, time, horizontal and vertical coordinates** | **Unit, scale** |
|  |  | *WIGOS identifier* |  |
| **3 01 150** | 0 01 125 | WIGOS identifier series | Numeric, 0 |
|  | 0 01 126 | WIGOS issuer of identifier | Numeric, 0 |
|  | 0 01 127 | WIGOS issue number | Numeric, 0 |
|  | 0 01 128 | WIGOS local identifier (character) | CCITT IA5 |
| 0 01 015 |  | Station or site name | CCITT IA5, 0 |
| 0 02 001 |  | Type of station | Code table, 0 |
|  |  | *Year, month, day* |  |
| 3 01 011 | 0 04 001 | Year(2) | Year, 0 |
|  | 0 04 002 | Month(2) | Month, 0 |
|  | 0 04 003 | Day(2) | Day, 0 |
|  |  | *Hour, minute* |  |
| 3 01 012 | 0 04 004 | Hour(2) | Hour, 0 |
|  | 0 04 005 | Minute(2) | Minute, 0 |
|  |  | *Latitude, longitude (high accuracy)* |  |
| 3 01 021 | 0 05 001 | Latitude (high accuracy) | Degree, 5 |
|  | 0 06 001 | Longitude (high accuracy) | Degree, 5 |
| 0 07 030 |  | Height of station ground above mean sea level | m, 1 |
| 0 07 031 |  | Height of barometer above mean sea level | m, 1 |
| ~~0 03 001~~ |  | ~~Surface station type~~ | ~~Code table, 0~~ |
| ~~0 08 010~~ |  | ~~Surface qualifier (for temperature data)~~ | ~~Code table, 0~~ |
| ~~3 01 091~~ |  | ~~Surface station instrumentation~~ |  |
|  | ~~0 02 180~~ | ~~Main present weather detecting system~~ | ~~Code table, 0~~ |
|  | ~~0 02 181~~ | ~~Supplementary present weather sensor~~ | ~~Flag table, 0~~ |
|  | ~~0 02 182~~ | ~~Visibility measurement system~~ | ~~Code table, 0~~ |
|  | ~~0 02 183~~ | ~~Cloud detection system~~ | ~~Code table, 0~~ |
|  | ~~0 02 184~~ | ~~Type of lightning detection sensor~~ | ~~Code table, 0~~ |
|  | ~~0 02 179~~ | ~~Type of sky condition algorithm~~ | ~~Code table, 0~~ |
|  | ~~0 02 186~~ | ~~Capability to detect precipitation phenomena~~ | ~~Flag table, 0~~ |
|  | ~~0 02 187~~ | ~~Capability to detect other weather phenomena~~ | ~~Flag table, 0~~ |
|  | ~~0 02 188~~ | ~~Capability to detect obscuration~~ | ~~Flag table, 0~~ |
|  | ~~0 02 189~~ | ~~Capability to discriminate lightning strikes~~ | ~~Flag table, 0~~ |
| ~~0 04 015~~ |  | ~~Time increment (= - n minutes)~~ | ~~Minute, 0~~ |
| ~~0 04 065~~ |  | ~~Short time increment ( = 1 minute)~~ | ~~Minute, 0~~ |
| ~~1 33 000~~ |  | ~~Delayed replication of 33 descriptors~~ |  |
| ~~0 31 001~~ |  | ~~Delayed descriptor replication factor (= n)~~ | ~~Numeric, 0~~ |
| 0 01 023 |  | Observation Sequence number | Numeric, 0 |
|  |  | **Pressure** |  |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 10 004 |  | Pressure | Pa, –1 |
| 0 10 051 |  | Pressure reduced to mean sea level | Pa, –1 |
| 0 07 004 |  | Pressure (standard level) | Pa, –1 |
| 0 10 009 |  | Geopotential height of the standard level | gpm, 0 |
| 2 04 000 |  | Cancel associated field |  |
|  |  | **Wind** |  |
| 1 18 000 |  | Delayed replication of 3 descriptors |  |
| 0 31 001 |  | Delayed descriptor replication factor | Numeric, 0 |
| ~~3 02 070~~ |  | ~~Wind data~~ |  |
| 0 07 032 |  | Height of sensor above local ground | m, 2 |
| ~~0 07 033~~ |  | ~~Height of sensor above water surface~~ | ~~m, 1~~ |
| 0 02 002 |  | Type of instrumentation for wind measurement | Flag table, 0 |
| 0 08 021 |  | Time significance = 2 Time averaged | Code table, 0 |
| 0 04 025 |  | Time period = –10 minutes, or number of minutes after a significant change of wind | Minute, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 11 001 |  | Wind direction | Degree true, 0 |
| 0 11 002 |  | Wind speed | m s-1, 1 |
| 2 04 000 |  | Cancel associated field |  |
| 0 08 021 |  | Time significance = missing value | Code table, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 11 043 |  | Maximum wind gust direction | Degree true, 0 |
| 0 11 041 |  | Maximum wind gust speed | m s-1, 1 |
| 0 11 016 |  | Extreme counterclockwise wind direction of a variable wind | Degree true, 0 |
| 0 11 017 |  | Extreme clockwise wind direction of a variable wind | Degree true, 0 |
| 2 04 000 |  | Cancel associated field |  |
| 0 04 025 |  | Time period = 0 minutes | Minute, 0 |
|  |  | ~~Temperature and humidity instrumentation~~ |  |
| ~~3 01 130~~ | ~~0 03 002~~ | ~~Generic type of humidity instrument~~ | ~~Code table, 0~~ |
|  | ~~0 03 003~~ | ~~Configuration of sensors~~ | ~~Code table, 0~~ |
|  | ~~0 03 004~~ | ~~Type of Shield or Screen~~ | ~~Code table, 0~~ |
|  | ~~0 03 005~~ | ~~Horizontal Width of Screen or Shield (x)~~ | ~~m, 2~~ |
|  | ~~0 03 006~~ | ~~Horizontal Depth of Screen or Shield (y)~~ | ~~m, 2~~ |
|  | ~~0 03 007~~ | ~~Vertical Height of Screen or Shield (z)~~ | ~~m, 2~~ |
|  | ~~0 03 008~~ | ~~Artificially Ventilated Screen or Shield~~ | ~~Code table, 0~~ |
|  | ~~0 03 009~~ | ~~Degree of Forced Ventilation at time of reading~~ | ~~m~~~~-3~~ ~~s~~~~-1~~~~, 1~~ |
|  | ~~0 33 003~~ | ~~Quality of humidity measurement~~ | ~~Code table, 0~~ |
|  |  | **Temperature and humidity data** |  |
| ~~3 02 072~~ |  |  |  |
| 1 11 000 |  | Delayed replication of 3 descriptors |  |
| 0 31 001 |  | Delayed descriptor replication factor | Numeric, 0 |
| 0 07 032 |  | Height of sensor above local ground | m, 2 |
| ~~0 07 033~~ |  | ~~Height of sensor above water surface~~ | ~~m, 1~~ |
| 0 08 010 |  | Surface qualifier | Code table, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 12 101 |  | Temperature/Air-temperature (scale 2) | K, 2 |
| 0 12 103 |  | Dew-point temperature (scale 2) | K, 2 |
| 0 13 009 |  | Relative humidity (original measured value) | %, 1 |
| 0 13 003 |  | Relative humidity | %, 0 |
| 2 04 000 |  | Cancel associated field |  |
| 0 07 032 |  | Height of sensor above local ground  (set to missing to cancel the previous value) | m, 2 |
| 0 08 010 |  | Surface qualifier  (set to missing to cancel the previous value) | Code table, 0 |
|  |  | **Soil temperature and soil moisture** |  |
| 1 07 000 |  | Delayed replication of 3 descriptors |  |
| 0 31 001 |  | Delayed descriptor replication factor | Numeric, 0 |
| 0 07 061 |  | Depth below land surface | m, 2 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 12 130 |  | Soil temperature | K, 2 |
| 0 13 111 |  | Soil moisture | g kg-1, 0 |
| 2 04 000 |  | Cancel associated field |  |
| 0 07 061 |  | Depth below land surface  (set to missing to cancel the previous value) | m, 2 |
|  |  | **Visibility** |  |
| 1 07 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 001 |  | Delayed descriptor replication factor | Numeric, 0 |
| ~~3 02 069~~ |  | Visibility data |  |
| 0 07 032 |  | Height of sensor above local ground | m, 2 |
|  | ~~0 07 033~~ | ~~Height of sensor above water surface~~ | ~~m, 1~~ |
| 0 33 041 |  | Attribute of following value | Code table, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 20 001 |  | Horizontal visibility | m, –1 |
| or |  |  |  |
| 0 15 051 |  | Meteorological optical range | m, 0 |
| 2 04 000 |  | Cancel associated field |  |
| 0 07 032 |  | Height of sensor above local ground  (set to missing to cancel the previous value) | m, 2 |
| ~~0 07 033~~ |  | ~~Height of sensor above water surface~~  ~~(set to missing to cancel the previous value)~~ | ~~m, 1~~ |
|  |  | **Cloud** |  |
| 1 02 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 3 02 073 |  | *Cloud data* |  |
|  | 0 20 010 | Cloud cover (total) | %, 0 |
|  | 1 05 004 | Replicate 5 descriptors four times |  |
|  | 0 08 002 | Vertical significance | Code table, 0 |
|  | 0 20 011 | Cloud amount | Code table, 0 |
|  | 0 20 012 | Cloud type | Code table, 0 |
|  | 0 33 041 | Attribute of following value | Code table, 0 |
|  | 0 20 013 | Height of base of cloud | m, –1 |
| 0 08 002 |  | Vertical significance (set to missing) | Code table, 0 |
| ~~1 01 000~~ |  | ~~Delayed replication of 1 descriptor~~ |  |
| ~~0 31 000~~ |  | ~~Short delayed descriptor replication factor~~ | ~~Numeric, 0~~ |
| ~~3 02 076~~ |  | ~~Precipitation, obscuration and other phenomena~~ |  |
|  | ~~0 20 021~~ | ~~Type of precipitation~~ | ~~Flag table, 0~~ |
|  | ~~0 20 022~~ | ~~Character of precipitation~~ | ~~Code table, 0~~ |
|  | ~~0 26 020~~ | ~~Duration of precipitation~~~~(3)~~ | ~~Minute, 0~~ |
|  | ~~0 20 023~~ | ~~Other weather phenomena~~ | ~~Flag table, 0~~ |
|  | ~~0 20 024~~ | ~~Intensity of phenomena~~ | ~~Code table, 0~~ |
|  | ~~0 20 025~~ | ~~Obscuration~~ | ~~Flag table, 0~~ |
|  | ~~0 20 026~~ | ~~Character of obscuration~~ | ~~Code table, 0~~ |
| ~~1 02 000~~ |  | ~~Delayed replication of 2 descriptors~~ |  |
| ~~0 31 000~~ |  | ~~Short delayed descriptor replication factor~~ | ~~Numeric, 0~~ |
| ~~0 13 155~~ |  | ~~Intensity of precipitation~~ | ~~kgm~~~~-2~~~~s~~~~-1~~~~, 4~~ |
| ~~0 13 058~~ |  | ~~Size of precipitation element~~ | ~~m, 4~~ |
|  |  | *(~~end of the replicated sequence)~~* |  |
|  |  | **Ice and State of the ground** |  |
| 1 05 000 |  | Delayed replication of 2 descriptors |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 20 031 |  | Ice deposit (thickness) | m, 2 |
| 0 20 032 |  | Rate of ice accretion | Code table, 0 |
| 2 04 000 |  | Cancel associated field |  |
| 1 04 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 3 02 078 |  | State of ground and snow depth measurement |  |
|  | 0 02 176 | Method of state of ground measurement | Code table, 0 |
|  | 0 20 062 | State of ground (with or without snow) | Code table, 0 |
|  | 0 02 177 | Method of snow depth measurement | Code table, 0 |
|  | 0 13 013 | Total snow depth | m, 2 |
| 2 04 000 |  | Cancel associated field |  |
|  |  | **Present weather** |  |
| 1 14 000 |  | Delayed replication of 2 descriptors |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 0 04 025 |  | Time period (= - n minutes) | Minute, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 20 003 |  | Present weather |  |
| 2 04 000 |  | Cancel associated field |  |
| 0 04 015 |  | Time increment (= -n minutes) |  |
| 0 04 025 |  | Time period (= - 1 minutes) | Minute, 0 |
| 0 04 065 |  | Short time increment (= 1 minutes) |  |
| 1 04 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 001 |  | Delayed descriptor replication factor(n) | Numeric, 0 |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 20 003 |  | Present weather |  |
| 2 04 000 |  | Cancel associated field |  |
|  |  | **Precipitation** |  |
| 1 02 000 |  | Delayed replication of 2 descriptors |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 3 02 079 |  | Precipitation measurement |  |
|  | 0 07 032 | Height of sensor above local ground | m, 2 |
|  | 0 02 175 | Method of precipitation measurement | Code table, 0 |
|  | 0 02 178 | Method of liquid water content measurement of  Precipitation | Code table, 0 |
|  | 0 04 025 | Time period (= - n minutes) | Minute, 0 |
|  | 0 13 011 | Total precipitation / total water equivalent of snow | kg m-2, 1 |
| 0 07 032 |  | Height of sensor above local ground  (set to missing to cancel the previous value) | m, 2 |
|  |  | **Evaporation** |  |
| 1 01 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 3 02 080 |  | Evaporation measurement |  |
|  | 0 02 185 | Method of evaporation measurement | Code table, 0 |
|  | 0 04 025 | Time period or displacement ( = - n minutes) | Minute, 0 |
|  | 0 13 033 | Evaporation /evapotranspiration | kg m-2, 1 |
|  |  | **Sunshine and radiation** |  |
| 1 01 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 3 02 081 |  | *Total sunshine data* |  |
|  | 0 04 025 | Time period (= - n minutes) | Minute, 0 |
|  | 0 14 031 | Total sunshine | Minute, 0 |
| 1 01 000 |  | Delayed replication of 1 descriptor |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 3 02 082 |  | *Radiation data* |  |
|  | 0 04 025 | Time period (= - n minutes) | Minute, 0 |
|  | 0 14 002 | Long-wave radiation, integrated over period specified | J m-2, -3 |
|  | 0 14 004 | Short-wave radiation, integrated over period specified | J m-2, -3 |
|  | 0 14 016 | Net radiation, integrated over period specified | J m-2, -4 |
|  | 0 14 028 | Global solar radiation (high accuracy),  integrated over period specified | J m-2, -2 |
|  | 0 14 029 | Diffuse solar radiation (high accuracy),  integrated over period specified | J m-2, -2 |
|  | 0 14 030 | Direct solar radiation (high accuracy),  integrated over period specified | J m-2, -2 |
|  |  | **Ligthning** |  |
| 1 05 000 |  | Delayed replication of 2 descriptors |  |
| 0 31 000 |  | Short delayed descriptor replication factor | Numeric, 0 |
| 0 04 025 |  | Time period (= - n minutes) | Minute |
| 2 04 006 |  | Add associated field |  |
| 0 31 021 |  | Associated field significance (e.g. = 6) | Code table, 0 |
| 0 13 059 |  | Number of flashes | Numeric |
| 2 04 000 |  | Cancel associated field |  |
| ~~1 01 000~~ |  | ~~Delayed replication of 1 descriptor~~ |  |
| ~~0 31 000~~ |  | ~~Short delayed descriptor replication factor~~ | ~~Numeric, 0~~ |
| ~~3 02 083~~ |  | ~~First order statistics of P, W, T, U data~~ |  |
|  | ~~0 04 025~~ | ~~Time period (= - n minutes)~~ | ~~Minute, 0~~ |
|  | ~~0 08 023~~ | ~~First order statistics~~  ~~(= 9; best estimate of standard deviation)~~ ~~(4)~~ | ~~Code table, 0~~ |
|  | ~~0 10 004~~ | ~~Pressure~~ | ~~Pa, –1~~ |
|  | ~~0 11 001~~ | ~~Wind direction~~ | ~~Degree true, 0~~ |
|  | ~~0 11 002~~ | ~~Wind speed~~ | ~~m s~~~~-1~~~~, 1~~ |
|  | ~~0 12 101~~ | ~~Temperature/air temperature (scale 2)~~ | ~~K, 2~~ |
|  | ~~0 13 003~~ | ~~Relative humidity~~ | ~~%, 0~~ |
|  | ~~0 08 023~~ | ~~First order statistics (= missing value)~~ | ~~Code table, 0~~ |
| ~~0 33 005~~ |  | ~~Quality information (AWS data)~~ | ~~Flag table, 0~~ |
| ~~0 33 006~~ |  | ~~Internal measurement status information (AWS)~~ | ~~Code table, 0~~ |

1. WIGOS Station Identifiers shall be used for n-minute period observations.
2. The time identification refers to the end of the n-minute period.
3. ~~Duration of precipitation (in minutes) represents number of minutes in which any precipitation was registered~~.
4. ~~Best estimate of standard deviation is counted out of a set of samples (signal measurements) recorded within the period specified; it should be reported as a missing value, if the measurements of the relevant element are not available from a part of the period specified by 0 04 025.~~
5. ~~If reporting nominal values is required, the template shall be supplemented with 3 07 093.~~
6. The height above local ground 0 07 032 referring to ground temperature shall be considered as a variable. After a snowfall, the sensor is placed at the top of the snow layer and the changed value of 0 07 032 shall indicate this procedure (total snow depth is reported in 0 13 013).