|  |  |  |
| --- | --- | --- |
| WORLD METEOROLOGICAL ORGANIZATION  COMMISSION FOR BASIC SYSTEMS  -----------------------------  SECOND MEETING OF  INTER-PROGRAMME EXPERT TEAM ON DATA REPRESENTATION MAINTENANCE AND MONITORING  COLLEGE PARK, USA, 28 APRIL - 2 MAY 2014 |  | IPET-DRMM-II / Doc. 11.3  (24. 4. 2014)  -------------------------  ITEM 11.3  ENGLISH ONLY |

COLLABORATION WITH OTHER ORGANIZATIONS AND TECHNICAL BODIES

**Site Positions and Instrument heights in BUFR metadata**

*Submitted by Richard Weedon (UK Met Office)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Summary and Purpose of Document**

This document will outline inconsistencies found in BUFR metadata for site position and instrument heights

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ACTION PROPOSED**

The meeting is requested to note the information and consider the proposal for the replacement of WMO Publication 9, Volume A.

**ANNEXES:**

1. Listing of metadata comparisons for site locations and instrument heights.
2. WMO Publication No.9 - Flatfile - Record Layout
3. WMO Publication No.9 – Radiosonde Catalogue

**DISCUSSIONS**

The WMO catalogue of “Observing Stations and Radiosondes” supplies a listing of all surface and upper air stations currently in operation for synoptic purposes. The catalogue is based upon a flat file structure for Land Surface Stations with upper air stations listed in a separate excel spreadsheet. Details of both catalogues are given in annexes B & C.

The current locations registers were originally developed to supplement the Metadata available for TAC transmissions. The addition of new or changes to existing site information, is achieved through the submission of an on-line form to the WMO Secretariat.

Changes to the Location Registers are publicised by a variety of means –

|  |  |
| --- | --- |
| Source | Description |
| METNO’s | Details received from WMO on a weekly basis give details of station which have opened and closed. Updates to station details may take months to be broadcast. |
| WMO Newsletter | This is produced every two months and contains a section detailing changes. |
| GETNOT’s | This is a bulletin similar in format to METNO’s which is received at irregular intervals from the Canadian Met Service. |

In preparation for the transition to from Traditional Alphanumeric Code to Table Driven Code forms, the UK Met Office has initiated a number of projects to assess the impact of the change. One of these projects has identified inconsistencies between the site locations quoted in the BUFR Metadata and those quoted in the official [[1]](#footnote-1)WMO registry.

Whilst it is difficult to assess the full impact of these inconsistencies, their existence has caused concern within the NWP community. An illustration of the errors found to date in Land SYNOP Metadata is given in Annexe A. In some cases these may be attributed to the encoding process which has converted the Lat and Lon incorrectly.

The conversion of Lat and Lon from Degrees, Minutes and Seconds to a decimal representation is not always carried out in the correct manner as is the case in annexe A.

**PROPOSAL**

The 2013 meeting of the IPET-DRMM endorsed the publication of BUFR Tables through web-accessible registers. The registers are currently being developed using the meta-data model derived from ISO19135 “Procedures for registration”.

It follows that the same framework may be applied for the administration of the Meta-data associated with BUFR data received over the GTS. By definition a “Register” is an official List or Record” governed by some level of authority.

Publication of the stations metadata in this manner would be beneficial for a number of reasons –

* Multiple versions of the Station location lists may exist which gives rise to errors. The registry framework demands that each entry be identified by a HTTP URI which will be resolved through DNS, thereby providing a definitive reference to the positional and other metadata for the site.
* The registry will provide both human and machine readable data. This includes content negotiation and support for RDF/XML and JSON.
* The metadata associated with each station entry is extensible and will include not only positional data but also metadata on the instruments used. The register manager will determine the limits to be applied.
* The registry supports strong governance through ISO 19135 which defines the regime through which items are managed. Only authorised users will be able to make changes, as a life cycle model for registration is enforced.
* The Web Register supports versions management, allowing for access to historical versions.

**Annexe A**

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Summary of differences in distance GT 5km or differences in height GT 0

WMO Master Message Metadata

station no lat lon Stn height lat lon Stn height || Diff Dist (Km) Diff Height (m)

47100 37.677200 128.718300 773.18 || 37.680000 128.750000 843.0 || 2.805330 -69.820000

47102 37.966100 124.630600 145.46 || 37.970000 124.630000 147.0 || 0.436564 -1.540000

Distances - calculated using the Haversine formula

Distances - 9999 signifies missing data.

Height - 9999 signifies missing data.

BUFR Metadata extracted from ISMC22\_DKPY\_111200.DAT

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Summary of differences in distance GT 5km or differences in height GT 0

WMO Master Message Metadata

station no lat lon Stn height lat lon Stn height || Diff Dist (Km) Diff Height (m)

41909 24.250000 89.933300 9999.0 || 24.150000 89.560000 9999 || 39.435537 9999.0

41929 23.600000 89.850000 8.0 || 23.360000 89.510000 9999 || 43.728648 9999.0

41939 23.166700 90.183300 7.0 || 23.100000 90.110000 9999 || 10.537849 9999.0

41926 23.650000 88.816700 9999.0 || 23.390000 88.490000 9999 || 44.078268 9999.0

41933 23.433300 91.183300 9.0 || 23.260000 91.110000 9999 || 20.659103 9999.0

41863 25.650000 88.683300 36.0 || 25.390000 88.410000 9999 || 39.823876 9999.0

41895 24.366700 88.700000 17.0 || 24.220000 88.420000 9999 || 32.711402 9999.0

Distances - calculated using the Haversine formula

Distances - 9999 signifies missing data.

Height - 9999 signifies missing data.

BUFR Metadata extracted from ISMC40\_VGDC\_111200.DAT

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Annexe B - WMO Publication No. 9, Volume A, Observing Stations High & Low Precision

|  |  |  |  |
| --- | --- | --- | --- |
| **Field No** | **Field Code Name** | **Definition** | **Comments** |
| 1 | RegionId | WMO region number |  |
| 2 | Region Name | Name of WMO region | Region name, in English and French |
| 3 | Country Area | Name of country or area | Country or area (in English and French) in which station is located. |
| 4 | Country Code | Code number of country or area | Code number used in pre-May 1997 data files to identify the country or area of a station. |
| 5 | StationId | Station identifier number | The station identifier is the "KeyField Value" used by the data base |
| 6 | IndexNbr | WMO Station Index Number (a) | Unique station identifier, used in the transmission of weather observation reports from the station.(a) |
| 7 | Index SubNbr | Sub-index number | A sub-index number is inserted for each station. It is used in the data file to differentiate between two stations with the same index number, usually established at the same (or nearly the same) location/elevation, one for surface and one for upper-air observations. The first station to be established under any station index number always has a sub-index of "0". If a second, *separate* station with that index number is opened for upper-air observations, it will be assigned a sub-index number of "1". |
| First station established under a given station index number (surface and/or upper-air) |
| Second station opened under a given station index number, for upper-air observations |
| 8 | Station Name | Name of station | Station's name, assigned by the country |
| 9 | Lat | Latitude | **High Resolution**  Latitude, in degrees, minutes and integer seconds:  **Low Precision**  Latitude, in degrees, minutes  **N- North of the equator**  **S – South of the equator** |

|  |  |  |  |
| --- | --- | --- | --- |
| 10 | Lon | Longtitude | **High Resolution**  Latitude, in degrees, minutes and integer seconds:  **Low Precision**  Latitude, in degrees, minutes  **E- East of the Greenwich Meridian**  **W- West of the Greenwich Meridian** |
| 11 | Hp | Elevation of the station | **High Resolution**  Elevation of the station, in Metres rounded up to two decimals;  **Low Precision**  Elevation of the station, in Metres;  - the datum level to which barometric pressure reports *at* the station refer; such current barometric values being termed “station pressure” and understood to refer to the given level for the purpose of maintaining continuity in the pressure records |
| 12 | HpFlag | Indicates approximate figure | A hash sign ("#") is inserted if the elevation figure shown for HP is approximate. |
| 13 | Hha | Elevation or Altitude: H or HA | H: For stations *not* located on aerodromes:  **High Resolution**  Elevation¹ of the ground in meters rounded up to two decimals. *(Height above mean sea level of the ground on which the rain gauge stands or, if there is no rain gauge, the ground beneath the thermometer screen. If there is neither rain gauge nor screen, it is the average level of terrain in the immediate vicinity of the station*)  **Low Resolution**  Elevation¹ of the ground in meters rounded up to two decimals. (Average level of the terrain in the vicinity of the station). |
| HA: For stations located on aerodromes: official altitude¹ of the aerodrome. These stations are designated by the letter "A" in the column/field "Other observations and remarks" (*see Field 29 below, and Code Table A - Observations and Remarks*). |
| 14 | HhaFlag | Indicates approximate figure | A hash sign ("#") appears if the elevation figure shown for H or HA is approximate. |

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | PressureDefId | Pressure level | For stations which do not indicate air pressure reduced to mean sea level in their synoptic reports (group 4PPPP), the following indicators show the information reported in lieu of group 4PPPP: |
| SYMBOL – STATION  Pressure at station level is reported using group 3PoPoPoPo. |
| SYMBOL - 1000 HPA 850 HPA 700 HPA 500 HPA  Geopotential of the given standard isobaric surface is reported using group 4a3hhh. |
| 16  17  18  19  20  21  22  23 | SO-1  SO-2  SO-3  SO-4  SO-5  SO-6  SO-7  SO-8 | Surface synoptic observations: at 00 UTC  at 03 UTC  at 06 UTC  at 09 UTC  at 12 UTC  at 15 UTC  at 18 UTC  at 21 UTC | Surface synoptic observations are made regularly at the time indicated, in accordance with a fixed schedule. |
| Time figures shown instead of an X (e.g. "02" under column "03" / in field "SO2") mean that observations are made regularly at the *time inserted* (e.g. 0200 UTC) instead of at the *standard* observation time for the corresponding column/field (in this case 0300 UTC). |
| No surface observations are made at the time indicated. |
| 24 | ObsHs | Hourly or Half-hourly surface observations | If surface observations are made on an hourly or half-hourly basis, this is indicated by the symbol H or S, followed by the period of the day during which this is done. When the period begins or ends at the half-hour, the full four-figure time is given. |
| Hourly observations are carried out during the period indicated. |
| Half-hourly (semi-hourly) observations are carried out during the period indicated. |

|  |  |  |  |
| --- | --- | --- | --- |
| 25  26  27  28 | UA-1  UA-2  UA-3  UA-4 | Upper-air observations: at 00 UTC  at 06 UTC  at 12 UTC  at 18 UTC | Upper-air observation of an unspecified type is carried out. |
| The symbol "X" is replaced by figures indicating a time (e.g. 23, 02, etc.) when the observation is carried out at a non-standard time. |
| Pilot-balloon: observation of upper-wind is obtained by optical tracking of a free balloon. |
| Radiosonde: observation of atmospheric pressure, temperature and humidity in the upper-air is obtained by electronic means. |
| Radiowind: upper-wind observation is obtained by tracking a free balloon by electronic means. |
| Wind Profiler: a wind profiler is used to obtain the upper-air observation. |
| The letters P, R and W are combined as necessary to indicate simultaneous upper-air observations of the different types listed above. |
| No upper-air observations are made at the time indicated. |
| 29 | ObsRems | Other observations and remarks | Information on additional observations made at the station, special types of stations, and additional information relating to other fields in the data file is shown here. (See ***Code Table A - Observations and Remarks*** for an explanation of the abbreviations and symbols used in this field.) |

# Annexe C - WMO Publication No. 9, Volume A , Radiosonde catalogue (.xls)

|  |  |  |
| --- | --- | --- |
| Field No | Description | *Qualifier* |
| 1 | Country |  |
| 2 | Station # |  |
| 3 | Station Name |  |
| 4 | Lat. |  |
| *5* | *Lon* |  |
| 6 | Hp Hha |  |
| 7 | Upper Air | *0* |
| 8 | *6* |
| 9 | *12* |
| 10 | *18* |
| 11 | CLIMAT |  |
| 12 | GUAN |  |
| 13 | Geo. Ht. Calculation?. |  |
| 14 | Radiation Corr. | Y/N |
| 15 | Type |
| 16 | Ground |  |
| 17 | Frequency |  |
| 18 | Radiosonde | *Regular* |
| 19 | *Alternative* |
| 20 | Windfinding system / Method |  |
| 21 | Windfinding Equipment |  |
| 22 | Remarks |  |

1. WMO Publication 9 Volume A [↑](#footnote-ref-1)