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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. 3.1 (3)  (18. 07. 2017)  -------------------------  ITEM 3.1  ENGLISH ONLY |

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

**Implementation of the Decision 15 of EC-69 regarding the International Exchange of Snow Data**

*Submitted by the Secretariat, GCW Project Office, on behalf of the Global Cryosphere Watch*

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**Summary and Purpose of Document**

This document outlines the actions required to enable the implementation of Decision 15 of EC-69, on the international exchange of snow data. Supportive information is provided.

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**ACTION PROPOSED**

**Global Cryosphere Watch *is requesting the collaboration of IPET-CM to ensure that the appropriate codes are available for the exchange of snow data, as approved by EC69.***

ANNEXES

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# DISCUSSIONS

The implementation of the Resolution 15 of EC-69 requires that appropriate codes are available for the international exchange of snow depth data and snow cover data. It is recognized that some provisions related to codes are no longer subject to change (see annex 3), and alternative means within the existing regulations are recommended.

# PROPOSAL

1. As decided at CBS Ext.-2014, the Commission agreed to facilitate **reporting zero snow depth** by suggesting that those Members using TAC nationally might consider using the unallocated entry 000 of code table 3889 to indicate zero snow depth, so that the information would be available when national reports are converted to TDCF.
2. Resolution 15 of EC-69 requires that the zero snow depth is exchanged internationally, which would mean that the entry 000 of code table 3889 would need to be made available internationally; i.e. there is a need to extend the decision of CBS Ext-2014 to the international exchange of data.
3. Additionally, the Resolution 15 of EC-69 approved the reporting of snow depth or snow cover at least once per day, at a time decided regionally or nationally. The resolution requires that this data is exchanged internationally. More than once per day snow data is strongly encouraged with an optimum of 4 times per day, at designated times.
4. The proposed changes to the Manual on Codes to reflect the decision of EC-69 are indicated below:

**WMO-No. 306 - Manual on Codes**

 Volume I.2 - Part C

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

**B/C1.8 State of ground, snow depth, ground minimum temperature <3 02 037>**

**B/C1.8.1 State of ground** (with or without snow) – Code table 0 20 062

State of ground without snow or with snow shall be reported using Code table 0 20 062. The synoptic hour at which this datum shall be reported shall be ~~is~~ determined by regional decision. In addition to the synoptic hour, this datum should be reported at other synoptic hours, i.e. four times a day.

**B/C1.8.2 Total snow depth**

Total snow depth (0 13 013) shall be reported in metres[[1]](#footnote-1) (with precision in hundredths of a metre). The synoptic hour at which this datum shall be ~~is~~ determined by regional decision. In addition to the synoptic hour, this datum should be reported at other synoptic hours, i.e. four times a day.

**B/C1.8.2.1** When total snow depth has to be reported[[2]](#footnote-2), it is reported as 0.00 m if no snow, ice and other forms of solid precipitation on the ground are observed at the time of observation. A snow depth value of “–0.01 m” shall indicate a little (less than 0.005 m) snow. A snow depth value of “–0.02 m” shall indicate “snow cover not continuous”.

**B/C1.8.2.2** The measurement shall include snow, ice and all other forms of solid precipitation on the ground at the time of observation. [12.4.6.1]

**B/C1.8.2.3** When the depth is not uniform, the average depth over a representative area shall be reported. [12.4.6.2]

**Supporting information**

# Annex 1: Implementation of EC-69, Resolution [15](#_Title_of_the) *— International Exchange of Snow Data;*

(excerpt from the EC-69 report, Resolution 15)

THE EXECUTIVE COUNCIL, **Decided** to approve the amendment to the *Manual on the Global Observing System*, Volume I: Global Aspects (WMO–No. 544) by adding new provisions, as follows:

(1) Members should report snow cover and snow depth four times a day, namely 00, 06, 12 and 18 UTC where snow is experienced and the capability to do so exists[[3]](#footnote-3);

(2) Members shall report snow cover and snow depth at least once a day at stations where snow is experienced and the capability to do so exists, and indicate the timing of these observations;[[4]](#footnote-4)

(3) Members shall report values of zero snow depth (0 cm) from the above stations when snow is not present, for the entire period during which snow can be expected[[5]](#footnote-5) and where the capability to do so exists. This period shall be defined for each location by the relevant Region;

(4) Snow cover should be reported in the state of ground field, where possible, and zero snow depth (absence of snow) should be reported in the quantitative snow depth field;

**Requested** Members to exchange in situ snow measurements in real-time in BUFR through the GTS/WIS in accordance with the *Manual on the GOS* (WMO-No. 544), and contribute to the derivation of regional cryosphere products, e.g. regional snow trackers;

**Requested** the Secretary-General to incorporate the approved amendment in the Manual and ensure adequate support for the execution of this Decision.

# Annex 2: Proposed changes to the Manual on GOS, WMO-No. 544, to reflect Resolution 15, EC-69

(excerpt from the updated draft Manual on the Global Observing System, WMO-No-544; the text in red below has been added to the manual as a result of the Resolution 15 of EC-69; headers in the Manual have been kept, to provide guidance on where changes were made)

Manual on the Global Observing System

Volume I – Global Aspects

Annex V to the WMO Technical Regulations

PART III. SURFACE-BASED SUBSYSTEM

2. Implementation of elements of the subsystem

2.3 Surface synoptic stations

*2.3.2 Land stations*

2.3.2.4 Surface synoptic observations at an automatic land station shall consist of observations of the following meteorological elements:

together with the following additional meteorological elements, which should be included if possible or as determined by resolutions of regional associations:

(k) snow depth or snow cover.

Notes:

3. Snow cover and snow depth are reported from stations where snow is experienced and the capabilities to observe and measure these variables exist, as determined by resolutions of regional associations

2.3.2.6 At a (manned or automatic) land station, surface synoptic observations shall be made and reported at least at the main standard times, except for snow depth or snow cover, where 2.3.2.7 and 2.3.2.8 applies

2.3.2.7 At a (manned or automatic) land station, snow cover or snow depth observations should be reported four times a day, at the main standard times, namely 00, 06, 12, 18 UTC

2.3.2.8 At a (manned or automatic) land station, snow cover or snow depth shall be reported at least once pr day, together with the time of the observation.

2.3.2.9 The snow depth shall be reported as zero (0 cm) when snow is not present, for the entire period during which snow can be expected but is not present, as determined by resolutions of regional associations.

~~2.3.2.10 Snow cover should be reported in the state of ground field, where possible, and zero snow depth (absence of snow) should be reported in the quantitative snow depth field~~

2.10 Climatological stations

2.10.8 At a principal climatological station, observations shall be made of all or most of the following meteorological elements, where appropriate:

(k) Snow cover and/or snow depth;

3. Equipment and methods of observation

*3.3 Surface Observations*

*3.3.17 Snow Depth and Snow Cover*

The measurement and observation of snow depth and snow cover shall be made according to the description provided in the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No.8), Part I.

# Annex 3: Overview of REGULATIONS FOR SNOW DEPTH REPORTING

8 June 2017

The previous code expert team, IPET-DRMM, discussed in 2014 the issue of snow depth reporting as follows, which would be a good reference to know what was done.

///// Extract from the report ///

Ground based observations of snow are very important for monitoring, model validation, validation of satellite-derived data, and increasingly for assimilation into Numerical Weather Prediction (NWP) models. Snow depth reports from SYNOP stations are currently assimilated by several NWP centres, and preparations are underway to develop similar snow depth assimilation capabilities at the UKMO. However, the current reporting practice, for which regional guidelines exist, results in an inconsistent approach to the reporting of zero snow depths.

Snow depth is generally only reported when snow is present (i.e. positive reports of zero snow are not made), with missing data recorded for snow depth in snow-free conditions. This leads to an ambiguity for data users as it cannot be known whether this missing data indicates no snow or a technical problem at the station, for instance an instrument failure or system outage. This missing data must therefore be discarded, though the majority of it could potentially contain valid positive reports of zero snow.

Traditional alphanumeric codes (TAC) are frozen. Under the migration to TDCF, amendments that have an impact to current operational practices are in principle not allowed.

Mr Richard Weedon, UKMO, emphasized that this issue of non-reporting of zero snow depths was gaining recognition in the international community, in particular Global Cryosphere Watch (GCW) Snow Watch initiative.

Mr Weedon added that changes are needed within the current TAC regulations to ensure reporting of snow depth on a regular basis regardless of the state of ground.

The meeting discussed this sensitive issue, reviewing some relevant issues, such as global and regional reporting practices. It was noted setting geographical limit is an option to avoid unnecessary conflict.

In consideration of purpose of migration, which is to facilitate data exchange, this amendment could be allowed on an additional basis unless it changes the code figures currently used.

However, the amendment needs to be submitted to a CBS session, and its expected implementation date will be November 2015, which is one year after the scheduled date of migration complete. It would therefore convey a wrong message to Members and some may stop making efforts for migration to TDCF.

The meeting reached a conclusion accordingly after the long discussion that a statement is to be included in the report of CBS session as shown in the annex to this paragraph to invite Members to report the snow group in SYNOP when snow is zero instead of the amendment to Code table 3889.

///// end ///

///// General Summary of CBS Report (CBS Ext. (2014)) /////

Reporting zero snow depth

2.3.12 Ground-based snow observations were important for monitoring, model validation, validation of satellite-derived data, and increasingly for assimilation into numerical weather prediction models. The Commission noted, however, that snow depth was generally reported only when snow was present and this led to an ambiguity in that users could not distinguish between missing snow depth data meaning *no snow* or meaning *no observation due to a technical problem at the station*, for instance an instrument failure or system outage. This had been identified as an issue by the Global Cryosphere Watch (GCW) Snow Watch initiative.

2.3.13 Explicit reporting of zero snow depth was standard practice in TDCF but was not possible in Traditional Alphanumeric Codes (TAC). The Commission had already decided that the TAC should not be changed, but recognized that the TAC were often used for collecting observations nationally. **The Commission agreed to facilitate reporting zero snow depth by suggesting that those Members using TAC nationally might consider using the unallocated entry 000 of code table 3889 to indicate zero snow depth, so that the information would be available when national reports are converted to TDCF.**

As noted above, CBS has already taken the practical approach for the issue of zero snow depth reporting.

In this relation, it is worth checking current regulations, which are available from Manual on Codes (WMO-No. 306), Volume I.1, I.2 and II.

a) Volume I.1

Regulations: FM 12 SYNOP family

Difficulty: Amendments to this volume is no longer allowed (Decision 5.2/2 (EC-69)).

///// Extract from Manual on Codes, Volume I.1 ///

12.4.5 Group (3Ejjj)

The use of the parameter(s) jjj shall be fixed regionally.

12.4.6 Group (4E´sss)

12.4.6.1 The measurement shall include snow, ice and all other forms of solid precipitation on the ground at the time of observation.

12.4.6.2 When the depth is not uniform, the average depth over a representative area shall be reported.

3889

sss Total depth of snow

Code figure

000 Not used

001 1 cm

etc. etc.

996 996 cm

997 Less than 0.5 cm

998 Snow cover, not continuous

999 Measurement impossible or inaccurate

Note: See Regulations 12.4.6.1 and 12.4.6.2.

///// End ///

2. Volume I.2

Regulations: Section d, Part C (B/C1) for reporting in BUFR

///// Extract from B/C1 /////

B/C1.8 State of ground, snow depth, ground minimum temperature <3 02 037>

B/C1.8.1 State of ground (with or without snow) – Code table 0 20 062

State of ground without snow or with snow shall be reported using Code table 0 20 062. The synoptic hour at which this datum is reported shall be determined by regional decision.

B/C1.8.2 Total snow depth

Total snow depth (0 13 013) shall be reported in metres (with precision in hundredths of a metre). The synoptic hour at which this datum is reported shall be determined by regional decision.

B/C1.8.2.1 When total snow depth has to be reported, it is reported as 0.00 m if no snow, ice and other forms of solid precipitation on the ground are observed at the time of observation. A snow depth value of “–0.01 m” shall indicate a little (less than 0.005 m) snow. A snow depth value of “–0.02 m” shall indicate “snow cover not continuous”.

B/C1.8.2.2 The measurement shall include snow, ice and all other forms of solid precipitation on the ground at the time of observation. [12.4.6.1]

B/C1.8.2.3 When the depth is not uniform, the average depth over a representative area shall be reported. [12.4.6.2]

///// End ///

3. Volume II

Regulations: Regional reporting practices for snow cover and depth by RAs.

///// Extract from Volume II /////

**RA I**

1/12.9 Groups (3Ejjj) (4E´sss)

1/12.9.1 The group 3Ejjj shall not be used in the Region.

1/12.9.2 Group (4E´sss) — Snow-depth data shall be reported by all stations capable of doing so, and included at least once daily at either 0600 or 1200 UTC.

**RA II**

2/12.9 Group (3Ejjj)

2/12.9.1 This group shall be made available only for regional exchange, its inclusion being left to national decision.

2/12.9.2 This group shall be used in the form 3EsnTgTg.

2/12.9.3 If ice and/or snow data are available, this group shall be reported in the form 3EsnTgTg = 3/snTgTg.

2/12.10 Group (4E´sss)

2/12.10.1 This group shall be included in the synoptic report only if there is ground snow or ice cover.

2/12.10.2 The group 4E´sss shall be included at least once daily, preferably at 0000 UTC (the morning observation time over most of Region II).

2/12.10.3 Code table 0975 shall be used for coding the indicator (E´) of the presence and state of snow or ice cover. E´ shall be transmitted by all stations where such observations are carried out.

2/12.10.4 The snow depth or the thickness of ice cover shall be reported in sss, in accordance with Code table 3889.

**RA III**

3/12.7 Group (3Ejjj)

3/12.7.1 This group shall be made available only for regional exchange, its inclusion being left to national decision.

3/12.7.2 This group shall be used in the form 3EsnTgTg and included at 1200 UTC, if possible.

3/12.7.3 If ice and/or snow data are available, this group shall be reported in the form 3EsnTgTg = 3/snTgTg.

3/12.8 Group (4E´sss)

3/12.8.1 This group shall be made available for regional exchange. Where appropriate, the selection of stations for the inclusion of sss shall be decided nationally.

Note: This group is included only if ice and/or snow data are available.

3/12.8.2 This group shall be included at least once daily, preferably at 1200 UTC, if possible.

3/12.8.3 If the ground is covered by hail, this group shall be included in the next report.

**RA VI**

6/12.6 Group (3Ejjj)

6/12.6.1 The inclusion of this group shall be left to national decision.

Note: This group may be added in all seasons.

6/12.6.2 This group shall be used in the form 3EsnTgTg.

6/12.6.3 When used, the group 3EsnTgTg shall be added by a selection of stations to the SYNO P reports of 0600 UTC or, where this is not practicable, as an exception rather than a rule, to the reports of 0900 UTC.

6/12.6.4 In any case, the observations of the elements reported in this group shall be made at 0600 UTC.

6/12.6.5 If ice and/or snow are observed, this group shall be reported in the form 3EsnTgTg = 3/snTgTg.

6/12.7 Group (4E´sss)

6/12.7.1 This group shall be included only if snow or ice cover is observed on the ground.

6/12.7.2 Group 4E´sss shall be transmitted at least once daily, preferably at 0600 UTC (the morning observation time over most of Region VI). Members of the Region are also recommended to include this group at 1800 UTC.

6/12.7.3 Code table 0975 shall be used to code the indicator (E´) of the presence and state of snow or ice cover. E´ shall be transmitted by all stations making these observations.

6/12.7.4 The snow depth or the thickness of ice cover shall be reported for sss. Where appropriate, a selection of stations for the inclusion of sss shall be decided nationally.

///// End ///

# Annex 4: Decisions of the Regional Associations regarding the Implementation of the International Snow Data Exchange (RA II-16 and RA IV-17)

4.1: RA II-16 (2017) Decision 4.5/2, international exchange of snow data

THE ASSOCIATION,

**Recalling**:

(1) Resolution 60 (Cg-17) –WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services, that includes climate relevant cryospheric data, in particular snow cover and snow depth,

(2) Decision 50 (EC-68), urging Members to exchange *in situ* snow measurements in real-time,

**Recognizing**:

(1) The positive impact of snow depth data collected in Europe on NWP, using the BUFR template 3 07 101 (Snow observation), adopted by CBS-Ext.(2014),

(2) That the cryosphere is an integrative element within the climate system and provides one of the most useful indicators of climate change, yet, it is arguably the most under-sampled domain,

**Acknowledging**:

(1) The need for real-time access to in situ snow measurements to support future Polar and High Mountain Regional Climate Centres, as a tool of GFCS services provision,

(2) That the Global Cryosphere Watch (GCW) is a significant component of the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS), promoting interoperable and reference long-term observations, and near real-time data and information exchange,

**Having considered**:

(1) Recommendation 5.8(2)/2 (CBS-16), recommending to the Executive Council to approve the amendment to the *Manual on the Global Observing System, Volume I: Global Aspects* (WMO–No. 544) by adding new provisions for the reporting of snow cover and snow depth from all stations where snow is experienced, and requesting Members to exchange in situ snow measurements in real-time in BUFR through GTS/WIS in accordance with the *Manual on the GOS* (WMO-No. 544),

(2) The recommendations of the GCW Steering Group (GSG) at its fourth session (Cambridge, United Kingdom, 16-19 January 2017) to engage with the regional associations with the view to promote the exchange of snow data at the regional level,

**Requests** Members of RA II to:

(1) Report snow cover and snow depth in accordance with the new provisions of the *Manual on the Global Observing System, Volume I: Global Aspects* (WMO–No. 544);

(2) Assess for each station reporting internationally the period during which snow can be expected, and make sure that such information is recorded in OSCAR/Surface;

**Requests** the Secretary-General to provide adequate support to facilitate the execution of this Decision.

4.2 RA IV-17 (2017) Decision 4.5/2, international exchange of snow data

THE ASSOCIATION,

**Recalling**:

(1) Resolution 60 (Cg-17) –WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services, that includes climate relevant cryospheric data, in particular snow cover and snow depth,

(2) Decision 50 (EC-68), urging Members to exchange in situ snow measurements in real-time,

**Recognizing**:

(1) The positive impact of snow depth data collected in Europe on NWP, using the BUFR template 3 07 101 (Snow observation), adopted by CBS-Ext.(2014),

(2) That the cryosphere is an integrative element within the climate system and provides one of the most useful indicators of climate change, yet, it is arguably the most under-sampled domain,

**Acknowledging**:

(1) The need for real-time access to in situ snow measurements to support future Polar and High Mountain Regional Climate Centres, as a tool of GFCS services provision,

(2) That the Global Cryosphere Watch (GCW) is a significant component of the WMO Integrated Global Observing System (WIGOS) and the WMO Information System (WIS), promoting interoperable and reference long-term observations, and near real-time data and information exchange,

**Having considered**:

(1) Recommendation 41 (CBS-16), recommending to the Executive Council to approve the amendment to the *Manual on the Global Observing System, Volume I: Global Aspects* (WMO–No. 544) by adding new provisions for the reporting of snow cover and snow depth from all stations where snow is experienced, and requesting Members to exchange in situ snow measurements in real-time in BUFR through GTS/WIS in accordance with the *Manual on the GOS* (WMO-No. 544),

(2) The recommendations of the GCW Steering Group (GSG) at its fourth session (Cambridge, United Kingdom, 16-19 January 2017) to engage with the regional associations with the view to promote the exchange of snow data at the regional level,

**Requests** Members of RA IV to:

(1) Report snow cover and snow depth in accordance with the new provisions of the *Manual on the Global Observing System, Volume I: Global Aspects* (WMO–No. 544);

(2) Assess for each station reporting internationally the period during which snow can be expected, and make sure that such information is recorded in OSCAR/Surface;

**Requests** the Secretary-General to provide adequate support to facilitate the execution of this Decision.

1. *The reporting of snow depth in meters is extremely counterintuitive. While the resolution of reporting is centimetres, a future change for the units of measure from meters to centimetres is warranted, to align the reporting with the standard measurement practice and the capabilities of technologies used.* [↑](#footnote-ref-1)
2. *The EC -69 wording tried to reflect the fact that in practice, a service or a region may choose to identify specific periods of the year when snow is expected, climatologically, to address the fact that automatic technologies could misrepresent other changes in the state of ground (e.g. grass growing), as snow accumulation. See annex 1.* [↑](#footnote-ref-2)
3. *The reference to existing capabilities was included, to ensure that the requirement is misinterpreted as requesting new observing stations to be installed. This requirement refers only to existing staitons already measuring snow depth or observing snow cover.* [↑](#footnote-ref-3)
4. *The timing of the observation, when this is available only once a day is left up to the station operator, recognizing that in the case of stations where the observations are done manually, the availability of an observer is only partial, likely during regular business hours, and this would depend from country to country. The requirement was developed such that the burden on the provider of data is minimised.* [↑](#footnote-ref-4)
5. *The periods when snow is expected are those periods during the year when snow is climatologically expected, e.g. from November to April, as a function of location. This provision has been added to differentiate from the case when snow is not observed at all, to remove the risk of mistaking grass growing (for example) as fallen snow.* [↑](#footnote-ref-5)