

WMO CODE FORMS CHANGES

(Submitted by WMO)

Summary and purpose of document

This document explains the last changes related to satellite data recommended by the CBS/Implementation Coordination Team on ISS to be approved by the CBS and the Executive Council of WMO for their full operational implementation on 3 November 2003.

ACTION PROPOSED

CGMS Members are invited to take note of the information contained in this document and express any suggestion, remarks or request found necessary in the field of WMO Codes Forms used for exchange of satellite data.

Appendix:

List of code changes related to satellite data.

References:

1. Report of meeting of CBS/OPAG Implementation Coordination Team on Information Systems and Services, Geneva, 9-12 September 2002.
2. Report of meeting of CBS/Expert Team on Data Representation and Codes, Prague, 22-26 April 2002.
3. WMO pub. No. 306, Manual on Codes, Volume I.2.

WMO CODE FORMS CHANGES

Background

1. The Meeting of the CBS/Expert Team on Data Representation and Codes took place in Prague from 22 to 26 April 2002. The team examined the requirements for additions to binary code tables for encoding satellite data and recommended changes to Tables of the BUFR WMO Code Form and GRIB Edition 2 for full operational implementation on 3 November 2003. The CBS/OPAG Implementation/Coordination Team on Information Systems and Services who met in Geneva from 9 to 13 September 2002 endorsed the proposed additions to binary codes. It is understood that use of the new descriptors in pre-operational mode can be performed prior to the date of 3 November 2003 since these new code additions have been tested and validated. The additions to codes are listed below.

Additions to BUFR tables

2.1 *Approval of new entries in BUFR table D for exchanging geostationary satellite radiance data* (See annex to this paragraph in the Appendix)

A project has been ongoing between NOAA/NESDIS, ECMWF, EUMETSAT and the University of Wisconsin, among others, to exchange enhanced geostationary satellite radiance data in BUFR, and it was requested to assign revised BUFR Table D descriptors to the sequences of descriptors being exchanged. The Team approved for pre-operation the additional sequences found in Annex to this paragraph.

2.2 *New Table B descriptors for use with AMSU A/B satellite data* (See annex to this paragraph in the Appendix)

The Team agreed to recommend for pre-operational implementation two new BUFR/CREX Table B descriptors requested by USA for use in reporting certain types of AMSU A/B satellite data. The descriptors are found in Annex to this paragraph.

2.3 *Descriptor for use in reporting certain types of AIRS satellite data* (See annex to this paragraph in the Appendix)

The Team agreed to a new descriptor for use in reporting certain types of AIRS satellite data and recommended it for pre-operational implementation (see Annex to this paragraph).

2.4 *Additional entries in BUFR code tables to support JASON satellite data* (See annex to this paragraph in the Appendix)

The JASON satellite had been launched in December 2001. The measurements made by this spacecraft had large potential for use both in meteorology and oceanography fields. To support distribution of an associated near real-time product on the GTS from next autumn, France proposed extra entries in BUFR code tables. The Team agreed that some of the requested new descriptors (see Annex to this paragraph) needed further validation, but in principle the whole set was recommended for pre-operational implementation, as soon as validation would be confirmed.

2.5 *Additional entries in BUFR code tables for certain types of altimeter data* (See annex to this paragraph in the Appendix)

Additions to GRIB Edition 2

3. To support cloud mask products, an extra entry was inserted into Code Table 4.2 (Product Discipline 3, Product Category 0), as well as an associated code table (4.217). Following a suggestion from the EUMETSAT representative, a note recommending use of satellite series and numbers of band defined in the common code tables when available, was proposed to be added to the Product Definition Template (PDT 4.30) – Satellite Product, and the note was recommended for the next Manual update. These new entry and code table will be for pre-operational implementation this year and will be submitted to CBS for operational implementation in November 2003. (See annex to this paragraph in the Appendix)

Appendix

ANNEX to paragraph 2.1

New Common Sequences descriptors:

3-10-23	Geostationary satellite radiance data		
3-01-072	Satellite identification		
0-30-021	Number of pixels per row		
0-30-022	Number of pixels per column		
0-08-012	Land/sea qualifier		
0-07-024	Satellite zenith angle		
0-07-025	Solar zenith angle		
0-10-002	Height		
1-01-012	Replicate next descriptor 12 times		
3-04-032	Cloud fraction		
1-05-002	Replicate next 5 descriptors 2 times		
0-02-152	Satellite instrument used in data processing		
0-02-024	Integrated mean humidity computational method		
0-07-004	Pressure		
0-07-004	Pressure		
0-13-003	Relative humidity		
1-01-012	Replicate next descriptor 12 times		
3-04-033	Radiance		

3-10-24 Geostationary satellite radiance data

3-01-072	Satellite identification		
0-30-021	Number of pixels per row		
0-30-022	Number of pixels per column		
0-08-012	Land/sea qualifier		
0-07-024	Satellite zenith angle		
0-07-025	Solar zenith angle		
0-10-002	Height		
1-01-003	Replicate next descriptor 3 times		
3-04-032	Cloud fraction		
1-05-002	Replicate next 5 descriptors 2 times		
0-02-152	Satellite instrument used in data processing		
0-02-024	Integrated mean humidity computational method		
0-07-004	Pressure		
0-07-004	Pressure		
0-13-003	Relative humidity		
1-01-003	Replicate next descriptor 3 times		
3-04-033	Radiance		

ANNEX to paragraph 2.2

New BUFR/CREX descriptors:

Emissivity				
0-14-050	%	1	0	10
B-14-050	%	1		4

Snow cover

0-20-065	%	0	0	7
B-20-065	%	0		3

Notes:

Emissivity is the ratio of the amount of energy emitted from a particular object vs. the amount that would be emitted by a blackbody at the same temperature (i.e. the Planck function). Multiplying by 100 gives a percent (and provides 2 digits of precision at the same time!).

Snow cover will be reported for each satellite pixel as a percentage of coverage of the pixel, and it does not seem feasible to try to use existing descriptor 0-20-062 for such a purpose because the use of that descriptor additionally implies details on, e.g. snow drifts, wet vs. dry snow, etc. that a satellite obviously cannot accurately detect.

ANNEX to paragraph 2.3

New descriptor for use in reporting certain types of AIRS satellite data :

Principal component score	0-25-050	Numeric	4	-131072	18
	B-25-050	Numeric	4		6

ANNEX to paragraph 2.4**Additional entries in BUFR code tables to support JASON satellite data**

A. Append an asterisk to the element name for existing descriptor 0-25-060 in order to indicate that the actual meaning may be obtained from the originator of the data.

B. Additional Table B descriptors.

		Unit	Scale	Ref	Bits
0 02 173	Square of the off nadir angle	square degrees	4	0	10
0 04 007	Seconds within a minute (microsecond accuracy)	s	6	0	26
0 08 029	Remotely sensed surface type	Code table	0	0	8
0 08 074	Altimeter echo type	Code table	0	0	2
0 08 076	Type of band	Code table	0	0	6
0 13 090	Radiometer water vapor content	kg m ⁻²	0	0	7
0 13 091	Radiometer liquid content	kg m ⁻²	0	0	7
0 21 128	Number of valid points per second used to	Numeric	0	0	8

derive previous parameters

0 25 095	Altimeter state flag	Flag table	0	0	2
0 25 096	Radiometer state flag	Flag table	0	0	5
0 25 097	Three-dimensional error estimate of the navigator orbit	Code table	0	0	4

C. *Additional entries in existing Code tables*

In 0 01 007 - Common Code Table C-5: add 2 entries:

260 JASON-1
261 JASON-2

In 0 02 020: add 1 entry:

261 JASON

In 0 02 048: add 2 entries:

9 POSEIDON altimeter
10 JMR (Jason Microwave Radiometer)

In 0 08 023: add 1 entry:

13 Root mean square

D. *Additional code and flag tables*

0 08 029 Remotely sensed surface type

Value	Meaning
0	Open ocean or semi-enclosed sea
1	Enclosed sea or lake
2	Continental ice
3	Land
4-254	Reserved
255	Missing value

0 08 074 Altimeter echo type

Value	Meaning
0	open ocean or semi-enclosed sea
1	non-ocean like
2	reserved
3	Missing value

0 08 076 Type of band

Value	Meaning
0	Ku
1	C
2-62	Reserved

63 Missing value

0 25 095 Altimeter state flag

Bit	Indicator
1	Altimeter operating (0 if nominal, 1 if backup)
All 2	Missing value

0 25 096 Radiometer state flag

Bit	Indicator
1	Mode indicator (0 if Mode 2, 1 if Mode 1)
2	Mode 1 Calibration sequence indicator (0 if normal data taking either Mode 1 or 2, 1 if Mode 1 Calibration sequence)
	<i>Bits 3 and 4 indicate active 23.8 GHz channel(s):</i>
3	Channel 2 (0 if on, 1 if off)
4	Channel 3 (0 if on, 1 if off)
All 5	Missing value

0 25 097 Three-dimensional error estimate of the navigator orbit

Code	Meaning
0	Ranges between 0 and 30 cm
1	Ranges between 30 and 60 cm
2	Ranges between 60 and 90 cm
3	Ranges between 90 and 120 cm
4	Ranges between 120 and 150 cm
5	Ranges between 150 and 180 cm
6	Ranges between 180 and 210 cm
7	Ranges between 210 and 240 cm
8	Ranges between 240 and 270 cm
9	Ranges larger than 270 cm
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Missing value

Annex to paragraph 2.5

FOR USE WITH CERTAIN TYPES OF ALTIMETER DATA

In existing table Common Table C-5: BUFR 0-01-007 (Satellite Identifier), add new entries:

720 = TOPEX and 721 = GFO

Add new Table B entry:

0-05-044, Cycle number, Numeric, Scale = 0, Reference value = 0, Data width = 11 (BUFR)
4 (CREX)

Annex to paragraph 3*Additions to GRIB Edition 2***Product Discipline 3 : Space products****Parameter Category 0 : Image products**

Code figure	Field parameter	Units
7	Cloud mask	Code table (4.217)
8-191	Reserved	

Add:**Code Table 4.217:****Cloud mask type**

Code figure	Meaning
0	Clear over water
1	Clear over land
2	Cloud
3	No data
4-191	Reserved
192-254	Reserved for local use
255	Missing

Add note to Product Definition Template 4.30:

Note:

For "satellite series of band number", "satellite numbers of band number" and "instrument type of band number", it is recommended to encode the values as per BUFR code tables 0-02-020, 0-01-007 (Common Code Table C-5) and 0-02-019 (Common Code Table C-8) respectively.