WMO CODE FORM CHANGES

(Submitted by the WMO)

Summary and purpose of document

This document explains the last changes related to satellite data recommended by the CBS/Implementation Coordination Team on Data Representation and Codes and subsequently approved by the President of CBS and the President of WMO for their implementation on 8 November 2000.

ACTION PROPOSED

The Meeting is 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.

Annex: List of code changes related to satellite data.

References:

1. Final Report, WMO, CBS, OPAG on Information Systems and Services, The Meeting of the Implementation Coordination Team on Data Representation and Codes, Geneva, 10-14 April 2000.
2. WMO Pub. No. 306, Manual on Codes, Volumes I.1 and I.2

DISCUSSION

Background

1.   The Meeting of the CBS/OPAG on Information Systems and Services/Implementation/Coordination Team on Data Representation and Codes (ICT/DRC) took place in Geneva from 10 to 14 April 2000. The team examined the requirements for additions to BUFR tables for encoding satellite data and recommended changes to Tables of the BUFR WMO Code Form for implementation on 8 November 2000. The team did not recommend any addition to the traditional alphanumeric codes (SARAD; SATEM; SATOB) used for encoding satellite data. The team recommended that all new data types or parameters should be coded using the table driven codes BUFR or GRIB which offers self description, flexibility and easy expandability. The team also recommended to CBS XII the implementation of the Edition 2 of FM 92 GRIB, which will permit the encoding in grid representation of all types of processed satellite data. GRIB Edition 2 will be operational on 7 November 2001. The additions to codes are listed below.

Additions to BUFR tables

2.1   Modifications in BUFR for representing pixel values

        The representative of EUMETSAT presented a document explaining that the Table B entries currently available in BUFR do not allow the unambiguous representation of both saturated pixels and missing data. Possible ways of removing this ambiguity were discussed by the ICT. Finally, it was proposed to add a note under Table 30 (see the annex to this paragraph) to clarify the representation of pixel values. The ICT recommended also studying the possibility of defining new entries in Table 30 with data widths more appropriate to the existing satellites.

2.2   Representation of QUIKSCAT SEAWINDS data

        The ICT recommended that the proposal for supplementary entries (see Annex to this paragraph) to BUFR for QUICKSCAT data be approved since these data were already being exchanged.

2.3   Proposed additions for the representation of the new ATSR SST product (SADIST-2) format

        The ICT recommended additions listed in the Annex to this paragraph to BUFR tables for representing the new ATSR SST product (SADIST-2), which were already transmitted by ESA and received by several users.

2.4   Representation of Retrieved atmospheric gases data

        The ECMWF and UK Met Office have started to process retrieved atmospheric gases data. The ICT recommended the additional table entries required to encode the data as listed in the Annex to this paragraph.

Edition 2 of GRIB

3.   GRIB Editon 2 will permit the encoding of all gridded satellite data. The product definition is listed as example in annex to this paragraph.

ANNEX to paragraph 2.1

The addition of a note under Table 30 (image data) to clarify the representation of pixel values:

Add a note under Class 30:

Note:

In order to distinguish unambiguously the cases of missing data and saturated pixels, n-bit image data should be encoded using a data width of n+1. Where such a descriptor is not already available in Class 30, operator descriptor 2 01 YYY should be used to modify the data width of the existing entry as required.

ANNEX to paragraph 2.2

Additions for the representation of QUIKSCAT SEAWINDS data

Table B new entries required:

Reference	Meaning	Unit	Scale value	Ref. width	Data width
012065	Standard deviation brightness temperature	K	1	0	12
021120	Probability of rain	Numeric	3	0	10
021121	SEAWINDS NOF* rain index	Numeric	0	0	8
021122	Attenuation correction on sigma-0 (from tB)	dB	2	-10000	14
021123	SEAWINDS normalized radar cross section	dB	2	-30000	15

* NOF = Normalized Objective Function

Addition to 008025 code table

Code figure

   5   Time difference from edge of processing segment

Four additional Table D entries are required to represent SEAWINDS QUIKSCAT data. These are the sequences needed for BUFR Table D:

312028	301046	
	301011	
	301013	
	301023	
	008025	Time difference qualifier
	201136	Change data width
	004006	Second
	201000	Change data width back to Table B
	312031	
	312032	
	101004	Next descriptor replicated four times
	312030	
	101002	Next descriptor replicated two times
	312033	
	021110	Number of inner-beam sigma-0 (forward of satellite)
	301023	

	321028	
	021111	Number of outer-beam sigma-0 (forward of satellite)
	301023	
	321028	
	021112	Number of inner-beam sigma-0 (aft of satellite)
	301023	
	321028	
	021113	Number of outer-beam sigma-0 (aft of satellite)
	301023	
	321028	
321028	021118	Attenuation correction on sigma-0
	202129	Change scale
	201132	Change data width
	002112	Radar look angle
	201000	Data width back to Table B
	201131	Change data width
	002111	Radar incidence angle
	201000	Data width back to Table B
	202000	Scale back to table B
	002104	Antenna polarization
	021123	SEAWINDS normalized radar cross section
	021106	Kp variance coefficient (alpha)
	021107	Kp variance coefficient (beta)
	021114	Kp variance coefficient (gamma)
	021115	SEAWINDS sigma-0 quality flag
	021116	SEAWINDS sigma-0 mode flag
	008018	SEAWINDS land/ice surface flag
	021117	Sigma-0 variance quality control
312032	021120	Probability of rain
	021121	SEAWINDS NOF rain index
	013055	Intensity of precipitation
	021122	Attenuation correction on sigma-0 (from tB)
312033	002104	Antenna polarisation
	008022	Total number (with respect to accumulation)
	012063	Brightness temperature
	012065	Standard deviation brightness temperature

ANNEX to paragraph 2.3

Additions to represent the new ATSR SST product (SADIST-2) data:

Add new Table B entry:

0 21 070   SST product confidence data (SADIST-2)   Flag table   0   0   23

0 21 070
*SST product confidence data (SADIST-2)*

Bit   Meaning when set

1-9   Nadir-only view SST retrieval used 3.7micron channel (one bit per 10-arcmin cell)

1 Cell 1:nadir-only view SST used 3.7 micron channel 2 Cell 2:nadir-only view SST used 3.7 micron channel 3 Cell 3:nadir-only view SST used 3.7 micron channel 4 Cell 4:nadir-only view SST used 3.7 micron channel 5 Cell 5:nadir-only view SST used 3.7 micron channel 6 Cell 6:nadir-only view SST used 3.7 micron channel 7 Cell 7:nadir-only view SST used 3.7 micron channel 8 Cell 8:nadir-only view SST used 3.7 micron channel 9 Cell 9:nadir-only view SST used 3.7 micron channel	Cell numbering: NW NE 7 8 9 4 5 6 1 2 3 SW SE
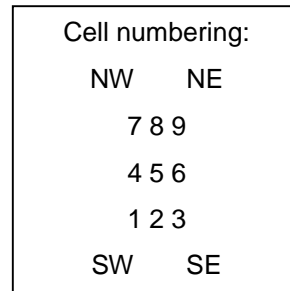
10-18   Dual view SST retrieval used 3.7micron channel (one bit per 10-arcmin cell)

10 Cell 1: dual view SST used 3.7 micron channel 11 Cell 2: dual view SST used 3.7 micron channel 12 Cell 3: dual view SST used 3.7 micron channel 13 Cell 4: dual view SST used 3.7 micron channel 14 Cell 5: dual view SST used 3.7 micron channel 15 Cell 6: dual view SST used 3.7 micron channel 16 Cell 7: dual view SST used 3.7 micron channel 17 Cell 8: dual view SST used 3.7 micron channel 18 Cell 9: dual view SST used 3.7 micron channel	Cell numbering: NW NE 7 8 9 4 5 6 1 2 3 SW SE
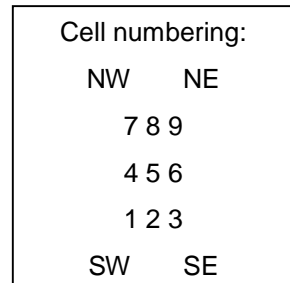
19   Nadir view contains day-time data (night if zero)
20   Forward view contains day-time data (night if zero)
21   Record contains contributions from instrument scans acquired when ERS platform not in yaw-steering mode
22   Record contains contributions from instrument scans for which Product Confidence Data show quality is poor or unknown
All 23 Missing value

New Table D entry:

(ATSR SST PRODUCT (SADIST-2))

TABLE REFERENCE	TABLE REFERENCES	ELEMENT NAME
3 12 027	3 01 047	ERS product header
	1 05 009	Repeat next 5 descriptors 9 times
	3 01 023	Location (coarse Latitude + Longitude) of 10-arcmin cell
	0 07 021	Elevation: Incidence angle Nadir view [set to zero]
	0 12 061	Skin temperature: SST [Nadir-only view]
	0 07 021	Elevation: Incidence angle Dual view [set to 'missing']
	0 12 061	Skin temperature: SST [Dual view]
	0 21 085	ATSR SST across-track band number [0-9]
	0 21 070	SST product confidence data (SADIST-2) [23-bit flag]

ANNEX to paragraph 2.4

Additions to represent retrieved atmospheric gases data:

Three new table B elements:

```
002172 Product type for retrieved atmospheric gases    Code table   0  0  8
010040 Number of retrieved layers                      Numeric      0  0 10
015020 Integrated O₃ density                           kg m⁻²       8  0 21
```

Code table   **002172**
Product type for retrieved atmospheric gases

Code figure   Meaning
   0   Reserved
   1   Retrieval from a nadir sounding
   2   Retrieval from a limb sounding
 3-254   Reserved
 255   Missing value

These are the sequences needed for BUFR Table D:

```
               (Ozone data)
310020    310022
          301011 Year, month, day
          301013 Hour, minute, second
          301021 Lat., long. (high accuracy)
          304034
          310021

310021    108000 Delayed replication of 8 next descriptors
          031001 Delayed descriptor replication factor
          201131 Change data width
          202129 Change scale
          007004 Pressure
          007004 Pressure
          202000 Change scale to Table B
          201000 Change data width to Table B
          015020 Integrated O₃ density
          010002 Height
310022    001007  Satellite identifier
          002019  Satellite instrument used
          001033  Identification of originating/generating centre
          002172  Product type for retrieved atmospheric gases
```

```
304034    102004  Replicating next two descriptors 4 times
          027001  Latitude(high accuracy)
          028001  Longitude(high accuracy)
          007022  Solar elevation
          005043  Field of view number
          020010  Cloud cover (total)
          020016  Pressure at top of cloud
          033003  Quality information table
          010040  Number of retrieved layers
```

ANNEX to paragraph 3

Product Definition Template 4.30: Satellite Product.

Octet Number(s)   Contents
        10   Parameter category (see Code Table 4.1)
        11   Parameter number (See Code Table 4.2)
        12   Type of generating process (see Code Table 4.3)
        13   Observation generating process identifier (defined by originating Centres)
        14   Number of contributing bands (NB)

Repeat the following 5 values for each contributing band (nb = 1,NB)

(15+5(nb-1))   Satellite series of band nb (code table defined by originating/generating Centre)
(16+5(nb-1))   Satellite numbers of band nb (code table defined by originating/generating Centre)
(17+5(nb-1))   Instrument types of band nb (code table defined by originating/generating Centre)
(18+5(nb-1))   Central wavelength number of band nb
(19+5(nb-1))   Central wavelength power of 10 of band nb