UPDATE ON SATELLITE DATA CODE FORMS
In response to CGMS actions 36.22, 36.23, 36.27

Amendments to the Manual on Codes (WMO No. 306) including those related to the satellite data, which were recommended by the fourteenth session of the WMO Commission for Basic Systems (CBS-XIV), were approved by the sixty-first session of the WMO Executive Council (EC-LXI) and will take effect as from 4 November 2009.

Amendments to the Manual on Codes separately proposed for RARS and other satellite data exchange have been circulated to the President of CBS for approval through the fast track procedure.

The second meeting of the Task Force on Satellite Data Codes (TFSDC-II) was convened on 14 September 2009 as a "virtual meeting" (through phone conference) and agreed some amendments to the Manual on Codes to be approved by the fast track procedure. TFSDC-II also agreed amendments on satellite data code forms to be submitted to the first meeting of the WMO/CBS Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC) (15-18 September 2009) followed by the TFSDC-II. Those amendments were discussed by the IPET-DRC-I and approved for validation or pre-operational use.

The TFSDC-II reviewed the new data typology currently under validation and agreed that more feedback was necessary to finalize it. It also reviewed Common Code Table C-5 in the light of currently planned satellite series.

Action/Recommendation proposed:

- To note the amendments to be effective as from 4 November 2009 for operational use;
- To note the amendments agreed by the first meeting of WMO/CBS/IPET-DRC for validation and pre-operational status;
- CGMS Members to draw an inventory of the products they generate and to allocate these products to the proposed data categories and sub-categories, as a "beta-testing" for the new typology, and provide feedback;
- Satellite Operators to ensure that, in advance of the launch of their satellites, or as soon as possible after the launch, the necessary steps are taken for the allocation of identifiers and other code values for the exchange of their data over the GTS;
- CGMS Members to ensure strong participation in the meetings and activities of the Task Force on Satellite Data Codes.

UPDATE ON SATELLITE DATA CODE FORMS

1.   Amendments by the CBS Recommendation 7 (CBS-XIV)

The fourteenth session of the WMO Commission for Basic Systems (CBS-XIV), held in Dubrovnik, Croatia from 25 March to 2 April 2009, recommended amendments to the Manual on Codes (WMO No. 306) and the Recomendation was approved by the sixty-first session of WMO Executive Council (EC-LXI) with effect from 4 November 2009. Amendments related to satellite data are extracted from the Recommendation 7 (CBS-XIV) in the Annex to this paragraph.

2.   Amendments by the fast track procedure

Fast track procedure can be used for additions to BUFR or CREX Tables A, B, and D with associated code tables or flag tables, to code tables or templates in GRIB and to common tables C. Amendments to the BUFR and Common Code Tables separately proposed for RARS and other satellite data exchange have been circulated to the President of CBS for approval through this procedure. Those amendments are included in the Annex to this paragraph.

3.   The second meeting of TFSDC and the first meeting of IPET-DRC

3.1   The second meeting of the TFSDC

The second meeting of the Task Force on Satellite Data Codes (TFSDC-II) was convened on 14 September 2009 as a "virtual meeting" (through phone conference).

3.1.1 Updated Terms of Reference and Membership

The Terms of Reference have been updated in response to CGMS Action 36.23, also taking into account the new structure of relevant CBS Expert Teams. These revised Terms of Reference are included in the Annex to this paragraph

Unfortunately, not all designated members have been in a position to participate in the meeting. The Task Force reiterated the need to ensure a wider participation of satellite operators and to reflect an appropriate range of user communities.

3.1.2 Amendments to the Manual on Codes proposed by theTFSDC

The TFSDC agreed some amendments to the Manual on Codes to be approved by the fast track procedure. TFSDC-II also agreed amendments on satellite data code forms to be submitted to the first meeting of WMO/CBS Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC) (15-18 September 2009) following the TFSDC-II. Those amendments to be approved by the fast track procedure and approved by the IPET-DRC-I for validation or pre-operational use are included in paragraph 3.2 below.

A review was made of the table of satellite identifiers (Common Code Table C-5) and its suitability to accommodate the currently planned satellite series for the coming decade. It was noted that:

- Common Code Table C-5 overall contains sufficient unassigned numbers overall to accommodate satellite identifiers for the foreseeable future;
- In the block of values reserved for the USA there is hardly any margin for future LEO satellites; the allocation of new ranges of values should thus be considered;
- Allocations should be reserved for new or future contributors to the GOS e.g. Brazil, Republic of Korea.
- Identifiers should be proposed for a few satellites that have been recently launched or are planned for launch in the near future (e.g. FY-2E, COMS-1, ADM-Aeolus…)

3.1.3 Validation of data categories and sub-categories

An important discussion took place on the new data categories and sub-categories that are currently under validation (see Common Code Table C-13). The feedback received was be taken into account. In paricular it was agreed:

- To introduce a sub-category in categories 027 (Gravity measurements (satellite)), 028 (Precision orbit (satellite)), 029 (Space environment (satellite)) as place holder for sub-categories to be defined at a later stage when input will be available from the relevant communities;

- To request the GSICS Data Management Working Group to express its needs for sub-categories under Category 030 (Calibration dataset (satellite));

- To prepare an editorial update of Category 101 Sub-category 007 in order to allow this sub-category to address "soil moisture and ocean salinity" with a generic understanding, without restricting its use to the SMOS mission of ESA;

- Besides these particular conclusions, the TFSDC felt the need to perform a more thorough review and to collect feedback from more data users and providers. In order to progress on a firm basis, it concluded that all CGMS satellite operators should be requested to draw an inventory of the products they generate and to allocate these products to the proposed data categories and sub-categories, as a "beta-testing" for the new typology.

3.1.4 Other recommendations from the second meeting of TFSDC

All satellite operators should be encouraged to develop metadata in order to fulfil their role as DCPCs. Cooperation and exchange of experience should be encouraged among satellite operators on this topic.

The third meeting of the Task Force shall be convened around May 2010, in advance of the IPET-DRC meeting to be held during Summer 2010. If possible, it should be a face-to-face meeting in order to facilitate interaction among the members. Participation of all members is strongly recommended, as well as external experts if relevant to represent key user communities.

3.2   The first meeting of IPET-DRC

3.2.1 Additional code table entries for METEOSAT data

In response to evolving user requirements, EUMETSAT has enhanced its atmospheric divergence product encoded in GRIB2. In order to make the data available as quickly as possible, local code table entries will be used in the short term. A product containing aerosol data over sea has also been developed and will be encoded in GRIB2. Hence the EUMETSAT requested new entries in Code Table 4.2, *Product Discipline 3 – Space products, parameter category 1: quantitative products* as Annex to this paragraph. The meeting approved it for pre-operational. It was informed that ECMWF would take the initiative and propose a generic method in GRIB2 for the association of quality information (and possible other associated information) and EUMETSAT could support the validation.

3.2.2 Coding of synthetic satellite data in GRIB2

The Deutscher Wetterdienst (DWD) operates regional numerical forecast models (COSMO) which produce synthetic satellite images using the RTTOV package. As the satellite template PDT 4.31 does only fit for observations, missing the forecast time information, which is able to encode with PDT 4.0. DWD proposed to add a new template for simulated satellite data, which is a combination of PDT 4.0 and PDT 4.31 as well as new parameters in Code table 4.2 as Annex to this paragraph.

3.2.3 Clarification needed for GDT 3.90 template in GRIB2

The X, Y coordinate system used in template 3.90 (and only in template 3.90) is not clearly defined. This has become apparent after discovering that different users have interpreted it differently.   The only operational examples seen at UK Met Office (UKMO) to date are files provided by EUMETSAT for the MSG MPEF program so the template is not yet in widespread use. In view of this, UKMO suggested clarification of Manual on Codes in this respect. The meeting agreed to include reference to a CGMS document in the Manual on Codes. During the meeting, EUMETSAT kindly offered to develop a Grid Definition Template for GRIB2 relating directly to the specifications used in the CGMS document.

3.2.4 Addition of sub-category to Common Code Table C-13

The MetOffice, United Kingdom, proposed sub-categories for GPS IWV data under Category 000 (surface data - land) and GPS RO data under Category 003 (vertical soundings – satellite).   Considering Category 003, Sub-category 50 (Radio occultation sounding) had been available for validation, the meeting approved the former for pre-operational as Annex to this paragraph.

3.2.5 New BUFR descriptors for ATMS data (for validation)

The ATMS (Advanced Technology Microwave Sounder) instrument is part of the next generation operational sensor suite selected to fly on the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) spacecraft. Sounding data from this instrument, when combined together with CrIS (Cross-Track Infrared Sounder) data attached to the same satellite, will support continuing advances in NWP (Numerical Weather Prediction) models to improve short and medium-range weather forecasts. NOAA/National Weather Service (NWS) proposed new tables B and D along with relevant code/flag tables and table entries for this purpose in coordination with members of the CGMS TFSDC (Task Force on Satellite Data and Codes). It was reported that in the coming months samples will be available in order to complete the validation procedure. In view of the above, the meeting agreed the proposal to be validated by UKMO and ECMWF as Annex to this paragraph.

3.2.6 Proposal for update to Common Code Tables

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) is a US-based organization of scientists conducting research using remote-sensing systems for meteorological and surface-based systems. It was formed as a collaboration between the University of Wisconsin, the US National Oceanic and Atmospheric Administration (NOAA) and the US National Aeronautics and Space Administration (NASA). Taking account of plans for the institute to develop and disseminate its own satellite wind products in BUFR, NOAA/NWS proposed a new originating centre in Common Code Tables C-1 and C-11 as well as some sub-centre entries in Common Code Table C-12. The meeting agreed the proposal for pre-operational use as Annex to this paragraph, in which the code figure was moved by request from the Meteorological Service of Canada (MSC) because of duplication.

3.2.7 New BUFR descriptors for CrIS data

The CrIS instrument is part of the next generation operational sensor suite selected to fly on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) spacecraft. The atmospheric data collected from the instrument will allow for the calculation of temperature and moisture profiles at high (~ daily) temporal resolution. The accurate, detailed atmospheric and moisture observations acquired from CrIS will be used for weather and climate applications. New tables B and D along with relevant code/flag tables and table entries for this purpose were proposed by NOAA/NWS. It was reported that simulated CrIS BUFR data was provided to potential users last winter and the validation completed by ECMWF, EUMETSAT and the United States. The meeting therefore approved the proposal as Annex to this paragraph for pre-operational use.

3.2.8 Updates to BUFR tables in support of the exchange of satellite data

A number of updates to the requirements for the representation of satellite products from EUMETSAT in BUFR have arisen since the 2008 Meeting of the Expert Team on Data Representation and Codes in Geneva. Thus, updated BUFR entries in Tables B and D and the associated code tables were proposed by EUMETSAT in order to support the encoding of meteorological products derived from data from

METEOSAT, JASON-2 and METOP satellites. The meeting approved the proposals for validation as Annex to this paragraph.

APPENDIX

ANNEX TO PARAGRAPH 1

The Recommendation 7 (CBS-XIV) was approved by EC-LXI for operational use as from 4 November 2009. Amendments to the BUFR code (no amendment to GRIB and CREX) and Common Code Tables related to satellite are:

- SBUV/2 ozone data
- Satellite data sub-category
- JASON2 OGDR data
- SMOS satellite data
- GOME Experiment data
- METOP GOME-2 BUFR template
- All sky radiance data

_____

➤ **FOR SBUV/2 OZONE DATA**

New Table D sequence

		(Ozone data)
3 10 019	0 01 007	Satellite identifier
	0 02 019	Satellite instruments ("624" = SBUV/2)
	3 01 011	Date
	3 01 013	Time
	3 01 023	Lat/Long
	0 07 025	Solar zenith angle
	0 08 021	Time significance ("28" = Start of scan)
	0 07 025	Solar zenith angle
	0 08 021	Time significance ("29" = End of scan)
	0 07 025	Solar zenith angle
	0 08 021	Time significance ("Missing" = Cancel)
	0 08 029	Remotely-sensed surface type
	0 05 040	Orbit number
	0 08 075	Ascending/descending orbit qualifier
	0 08 003	Vertical significance ("0" = Surface)
	0 10 004	Pressure (terrain)
	0 08 003	Vertical significance ("Missing" = Cancel)
	2 07 002	Increase scale, reference value and data width
	0 15 001	Total ozone
	2 07 000	Cancel increase scale, reference value and data width
	0 33 070	Total ozone quality
	0 15 030	Aerosol contamination index
	2 07 002	Increase scale, reference value and data width
	0 20 081	Cloud amount in segment (cloud fraction)
	2 07 000	Cancel increase scale, reference value and data width
	0 08 003	Vertical significance ("2" = Cloud top)
	0 33 042	Type of limit represented by following value ("0" = Exclusive lower limit)
	0 07 004	Pressure
	2 07 002	Increase scale, reference value and data width
	0 15 001	Total ozone (below cloud top pressure)
	2 07 000	Cancel increase scale, reference value and data width
	0 08 003	Vertical significance ("Missing" = Cancel)
	1 13 021	Repeat next 13 descriptors 21 times
	0 07 004	Pressure (at bottom of layer)

	0 07 004	Pressure (at top of layer)
	2 07 002	Increase scale, reference value and data width
	0 08 021	Time significance ("27" = First guess)
	0 15 005	Ozone p
	0 08 021	Time significance ("Missing" = Cancel)
	0 15 005	Ozone p
	0 33 007	% confidence
	2 07 000	Cancel increase scale, reference value and data width
	0 08 026	Matrix significance ("4" = Row of averaging kernel matrix)
	1 01 020	Repeat next descriptor 20 times
	0 25 143	Linear coefficient
	0 08 026	Matrix significance ("Missing" = Cancel)
	0 08 043	Atmospheric chemical type ("0" = Ozone)
	1 09 015	Repeat next 9 descriptors 15 times
	0 07 004	Pressure
	0 08 090	Decimal scale of following Table B values
	2 07 006	Increase scale, reference value and data width
	0 15 008	Scaled mixing ratio (volumetric)
	2 07 000	Cancel increase scale, reference value and data width
	0 08 090	Decimal scale of following Table B values ("Missing" = Cancel)
	2 07 002	Increase scale, reference value and data width
	0 33 007	% confidence
	2 07 000	Cancel increase scale, reference value and data width
	0 08 043	Atmospheric chemical type ("Missing" = Cancel)
	0 33 071	Profile ozone quality
	1 08 008	Repeat next 8 descriptors 8 times
	2 02 124	Change scale
	2 01 107	Change data width
	0 02 071	Spectrographic wavelength
	2 01 000	Cancel change data width
	2 02 000	Cancel change scale
	2 07 002	Increase scale, reference value and data width
	0 20 081	Cloud amount in segment (cloud fraction)
	2 07 000	Cancel increase scale, reference value and data width

New Table B descriptors

Table Reference	Element name	BUFR				CREX		
F X Y		Unit	Scale	Ref. value	Data width	Unit	Scale	Data width
0 15 030	Aerosol contamination index (see Note 6)	Numeric	2	-1000	12	Numeric	2	4
0 33 070	Total ozone quality	Code table	0	0	4	Code table	0	2
0 33 071	Profile ozone quality	Code table	0	0	4	Code table	0	2

➢ BUFR Code Tables for SBUV/2 Data:

0-33-070   Total ozone quality

0	Good retrieval
1	Bad aerosol information flag or NOAA-16 radiance anomaly
2	Solar zenith angle greater than 84 degrees
3	380nm residue greater than limit
4	Ozone inconsistency
5	Difference between profile ozone and step 3 total ozone exceeds threshold (set to 25 DU)

6	Step 1 ozone iteration did not converge
7	Any channel residue greater than 16 or bad radiance
8-14	Reserved
15	Missing

0-33-071   Profile ozone quality

0	Good retrieval
1	Solar zenith angle greater than 84 degrees
2	Difference between step 3 and profile total ozone greater than limit (25 DU)
3	Average final residue for wavelengths used in retrieval greater than threshold
4	Final residue greater than 3 times a priori error
5	Difference between retrieved and a priori greater than 3 times a priori error
6	Non-convergent solution
7	Upper level profile anomaly or stray light anomaly
8	Initial residue greater than 18.0 N-value units
9-14	Reserved
15	Missing

Add the following note to BUFR/CREX Class 15:

(6)   For this descriptor, numbers less than -1 indicate a predominance of scattering aerosols, increasing in concentration as the number becomes more negative. Numbers greater than +1 indicate a predominance of absorptive aerosols, increasing in concentration as the number becomes more positive. Numbers between -1 and +1 indicate clouds or noise.

Add the following entries to the existing code table for

0-08-029   Remotely-sensed surface type

4	Low inland (below sea level)
5	Mix of land and water
6	Mix of land and low inland
7-254	Reserved

➢ **Satellite Data Sub-category**

Addition of the following entries to Common Code Table C-13:

Category 003 - Vertical soundings (satellite)

Add:
     002 - ATOVS
     003 - AMSU-A
     004 - AMSU-B
     005 - HIRS
     006 - MHS
     007 - IASI

Category 012 - Surface data (satellite)
Add
     007 - ASCAT

➢ **JASON2 OGDR data**

It is proposed to use the following sequence of entries for the encoding of the JASON2 OGDR data (new entries are in _italicized and underlined_):

BUFR	Description	Unit	Scale	Reference	Width
F X Y	**Satellite**				
0 01 007	SATELLITE IDENTIFIER				
0 02 019	SATELLITE INSTRUMENTS				
0 01 096	ACQUISITION STATION IDENTIFIER				
0 25 061	SOFTWARE IDENTIFICATION				
0 05 044	SATELLITE CYCLE NUMBER				
0 05 040	ORBIT NUMBER				
0 01 030	NUMERICAL MODEL IDENTIFIER				
	Datation				
0 04 001	YEAR				
0 04 002	MONTH				
0 04 003	DAY				
0 04 004	HOUR				
0 04 005	MINUTE				
0 04 007	SECONDS WITHIN A MINUTE				
	Location and Surface Type				
0 05 001	LATITUDE (HIGH ACCURACY)				
0 06 001	LONGITUDE (HIGH ACCURACY)				
0 08 029	REMOTELY SENSED SURFACE TYPE				
0 08 074	ALTIMETER ECHO TYPE				
_0 08 077_	_RADIOMETER SENSED SURFACE TYPE_	_CODE TABLE_	_0_	_0_	_7_
	Flags				
_0 40 011_	_INTERPOLATION FLAG_	_FLAG TABLE_	_0_	_0_	_8_
_0 25 090_	_ORBIT STATE FLAG_	_CODE TABLE_	_0_	_0_	_4_
0 25 095	ALTIMETER STATE FLAG	CODE TABLE			
_0 25 098_	_ALTIMETER DATA QUALITY FLAG_	_FLAG TABLE_	_0_	_0_	_9_
_0 25 099_	_ALTIMETER CORRECTION QUALITY FLAG_	_FLAG TABLE_	_0_	_0_	_9_
0 21 144	ALTIMETER RAIN FLAG				
0 25 096	RADIOMETER STATE FLAG				
_0 40 012_	_RADIOMETER DATA QUALITY FLAG_	_FLAG TABLE_	_0_	_0_	_8_
_0 40 013_	_RADIOMETER BRIGHTNESS TEMPERATURE INTERPRETATION FLAG_	_CODE TABLE_	_0_	_0_	_3_
_0 21 169_	_ICE PRESENCE INDICATOR_	_CODE TABLE_	_0_	_0_	_2_
	Altimeter: Ku Band				

0 22 151	KU BAND OCEAN RANGE				
0 22 162	*RMS OF 20 Hz KU BAND OCEAN RANGE*	*M*	*3*	*0*	*16*
0 22 163	*NUMBER OF 20Hz VALID POINTS FOR KU BAND*	*NUMERIC*	*0*	*0*	*10*
0 25 160	*KU BAND NET INSTRUMENTAL CORRECTION*	*M*	*4*	*-120000*	*18*
0 25 133	SEA STATE BIAS CORRECTION ON KU BAND				
0 22 156	KU BAND SIGNIFICANT WAVE HEIGHT				
0 22 164	*RMS 20 HZ KU BAND SIGNIFICANT WAVE HEIGHT*	*M*	*3*	*0*	*16*
0 22 165	*NUMBER OF 20HZ VALID POINTS FOR KU BAND SIGNIFICANT WAVE HEIGHT*	*NUMERIC*	*0*	*0*	*10*
0 22 166	*KU BAND NET INSTRUMENTAL CORRECTION FOR SIGNIFICANT WAVE HEIGHT*	*M*	*3*	*-1000*	*11*
0 21 137	KU BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 21 138	STD KU BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 22 167	*NUMBER OF VALID POINTS FOR KU BAND BACKSCATTER*	*NUMERIC*	*0*	*0*	*10*
0 21 139	KU BAND NET INSTRUMENTAL CORRECTION FOR AGC				
0 21 118	ATTENUATION CORRECTION ON SIGMA-0				
0 21 145	*KU BAND AUTOMATIC GAIN CONTROL*	*DB*	*2*	*0*	*13*
0 21 146	*RMS KU BAND AUTOMATIC GAIN CONTROL*	*DB*	*2*	*0*	*8*
0 21 147	*NUMBER OF VALID POINTS FOR KU BAND AUTOMATIC GAIN CONTROL*	*NUMERIC*	*0*	*0*	*5*
	Altimeter: C band				
0 22 168	*C BAND OCEAN RANGE*	*M*	*3*	*0*	*31*
0 22 169	*RMS OF C BAND OCEAN RANGE*	*M*	*3*	*0*	*16*
0 22 170	*NUMBER OF 20Hz VALID POINTS FOR C BAND*	*NUMERIC*	*0*	*0*	*10*
0 25 161	*C BAND NET INSTRUMENTAL CORRECTION*	*M*	*4*	*-120000*	*18*
0 25 162	*SEA STATE BIAS CORRECTION ON C BAND*	*M*	*4*	*-6000*	*13*
0 22 171	*C BAND SIGNIFICANT WAVE HEIGHT*	*M*	*3*	*0*	*16*
0 22 172	*RMS 20HZ C BAND SIGNIFICANT WAVE HEIGHT*	*M*	*3*	*0*	*16*
0 22 173	*NUMBER OF 20HZ VALID POINTS FOR C BAND SIGNIFICANT WAVE HEIGHT*	*NUMERIC*	*0*	*0*	*10*

0 22 174	*C BAND NET INSTRUMENTAL CORRECTION FOR SIGNIFICANT WAVE HEIGHT*	*M*	*3*	*-1000*	*11*
0 21 170	*C BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT*	*DB*	*2*	*-32768*	*16*
0 21 171	*RMS C BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT*	*DB*	*2*	*-32768*	*16*
0 22 175	*NUMBER OF VALID POINTS FOR C BAND BACKSCATTER*	*NUMERIC*	*0*	*0*	*10*
0 21 172	*C BAND NET INSTRUMENTAL CORRECTION FOR AGC*	*DB*	*2*	*-2048*	*12*
0 21 118	ATTENUATION CORRECTION ON SIGMA-0				
0 21 173	*C BAND AUTOMATIC GAIN CONTROL*	*DB*	*2*	*0*	*13*
0 21 174	*RMS C BAND AUTOMATIC GAIN CONTROL*	*DB*	*2*	*0*	*9*
0 21 175	*NUMBER OF VALID POINTS FOR C BAND AUTOMATIC GAIN CONTROL*	*NUMERIC*	*0*	*0*	*10*
	Radiometer				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 13 090	RADIOMETER WATER VAPOR CONTENT				
0 13 091	RADIOMETER LIQUID CONTENT				
	Wind				
0 07 002	HEIGHT OR ALTITUDE				
0 11 097	*WIND SPEED FROM ALTIMETER*	*M/S*	*2*	*0*	*12*
0 11 098	*WIND SPEED FROM RADIOMETER*	*M/S*	*2*	*0*	*12*
0 07 002	HEIGHT OR ALTITUDE				
0 11 095	U COMPONENT OF THE MODEL WIND VECTOR				
0 11 096	V COMPONENT OF THE MODEL WIND VECTOR				
	Dynamic Topography				
0 10 096	*MEAN DYNAMIC TOPOGRAPHY*	*M*	*3*	*-131072*	*18*
0 10 081	ALTITUDE OF COG ABOVE REFERENCE ELLIPSOID				
0 10 082	INSTANTANEOUS ALTITUDE RATE				

0 10 083	OFF NADIR ANGLE OF THE SATELLITE FROM PLATFORM DATA				
0 10 101	*SQUARED OFF NADIR ANGLE OF THE SATELLITE FROM WAVEFORM DATA*	*DEGREES ^2*	*2*	*-32768*	*16*
0 25 132	IONOSPHERIC CORRECTION FROM MODEL ON KU BAND				
0 25 163	*ALTIMETER IONOSPHERIC CORRECTION ON KU BAND*	*M*	*3*	*-32768*	*16*
025 126	MODEL DRY TROPOSPHERIC CORRECTION				
0 25 128	MODEL WET TROPOSPHERIC CORRECTION				
0 25 164	*RADIOMETER WET TROPOSPHERIC CORRECTION*	*M*	*4*	*-5000*	*13*
0 10 085	MEAN SEA SURFACE HEIGHT				
0 10 097	*MEAN SEA SURFACE HEIGHT FROM ALTIMETER ONLY*	*M*	*3*	*-131072*	*18*
0 10 086	GEOID'S HEIGHT				
0 10 087	OCEAN DEPTH/LAND ELEVATION				
0 10 092	SOLID EARTH TIDE HEIGHT				
0 10 088	GEOCENTRIC OCEAN TIDE HEIGHT SOLUTION 1				
0 10 089	GEOCENTRIC OCEAN TIDE HEIGHT SOLUTION 2				
0 10 098	*LOADING TIDE HEIGHT GEOCENTRIC OCEAN TIDE SOLUTION 1*	*M*	*4*	*-2000*	*12*
0 10 099	*LOADING TIDE HEIGHT GEOCENTRIC OCEAN TIDE SOLUTION 2*	*M*	*4*	*-2000*	*12*
0 10 090	LONG PERIOD TIDE HEIGHT				
0 10 100	*N0N-EQUILIBRIUM LONG PERIOD TIDE HEIGHT*	*M*	*4*	*-2000*	*12*
0 10 093	GEOCENTRIC POLE TIDE HEIGHT				
0 25 127	SEA SURFACE HEIGHT CORRECTION DUE TO PRESSURE LOADING				
0 40 014	*HIGH FREQUENCY FLUCTUATIONS OF THE SEA SURFACE TOPOGRAPHY CORRECTION*	*M*	*4*	*-3000*	*13*

It is proposed to allocate the Table D entry *3 40 005* for the above sequence.

Proposal for code and flag tables

0 08 077

Radiometer sensed surface type

Code figure

0	Land
1	Sea
2	Coastal
3	Open ocean or semi-enclosed sea
4	Enclosed sea or lake
5	Continental ice
6-126	Reserved
127	Missing value

0 40 011

Interpolation flag

Bit number

1	Mean sea surface (MSS) interpolation flag
2	Ocean tide solution 1 interpolation flag (0=4 points over ocean, 1=less than 4 points)
3	Ocean tide solution 2 interpolation flag (0=4 points over ocean, 1=less than 4 points)
4	Meteorological data interpolation flag (0=4 points over ocean, 1=less than 4 points)
5	Spare
6	Spare
7	Spare
All 8 bits	Missing

0 25 090

Orbit state flag

Code figure

0	Orbit computed during a manoeuvre
1	Adjusted mission operations orbit
2	Extrapolated mission operations orbit
3	Adjusted (preliminary/precise) orbit
4	(preliminary/precise) orbit is estimated during a manoeuvre period
5	(preliminary/precise) orbit is interpolated over a tracking data gap
6	(preliminary/precise) orbit is extrapolated for a duration less than 1 day
7	(preliminary/precise) orbit is extrapolated for a duration that ranges from 1 day to 2 days
8	(preliminary/precise) orbit is extrapolated for a duration larger than 2 days, or that the orbit is extrapolated just after a manoeuvre
9	DORIS[†] DIODE[‡] navigator orbit
10 - 14	Reserved
15	Missing value

[†] DORIS stands for "Doppler Orbitography and Radio-positioning Integrated by Satellite".
[‡] DIODE means "Détermination Immédiate d'Orbite par Doris Embarqué" or immediate onboard orbit determination by DORIS. It is part of the DORIS instrument, which calculates the satellite's position and velocity.

0 25 097

Three dimensional error estimate of the navigator orbit

Code figure

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 - 14	Reserved
15	Missing value

0 25 098

Altimeter data quality flag

Bit number	(0 is good, 1 is bad)
1	Ku band range
2	C band range
3	Ku band SWH*
4	C band SWH*
5	Ku band backscatter coefficient
6	C band backscatter coefficient
7	Off nadir angle from Ku band waveform parameters
8	Off nadir angle from platform
All 9 bits	Missing

* SWH stands for "Significant wave height"

0 25 099

Altimeter correction quality flag

Bit number	(0 is good, 1 is bad)
1	Ku band range instrumental correction
2	C band range instrumental correction
3	Ku band SWH* instrumental correction
4	C band SWH* instrumental correction
5	Ku band backscatter coefficient instrumental correction
6	C band backscatter coefficient instrumental correction
7	Spare
8	Spare
All 9 bits	Missing

* SWH stands for "Significant wave height"

0 40 012

Radiometer data quality flag

Bit number	(0 is good, 1 is bad)
1	18.7 GHz brightness temperature
2	23.8 GHz brightness temperature
3	34 GHz brightness temperature
4	Spare
5	Spare
6	Spare
7	Spare

All 8 bits   Missing

0 40 013

Radiometer brightness temperature interpretation flag

Code figure
0   Interpolation with no gap between JMR[§] data
1   Interpolation with gaps between JMR[§] data
2   Extrapolation of JMR[§] data
3   Failure of extrapolation and interpolation
4 - 6   Reserved
7   Missing

§ JMR stands for "JASON-1 Microwave Radiometer"

0 21 169

Ice presence indicator

Code figure
0   No ice present
1   Ice present
2   Reserved
3   Missing

➢ **SMOS Satellite data**

Proposed new Table B entries

Table Reference F X Y	Element name	BUFR				CREX		
		Unit	Scale	Ref. value	Data width	Unit	Scale	Data width
001144	Snapshot identifier	Numeric	0	0	31	Numeric	0	10
015012	Total electron count per square metre	1/M**2	-16	0	6	1/M**2	-16	2
012165	Direct sun brightness temperature	K	0	0	23	K	0	7
012166	Snapshot accuracy	K	1	-4000	13	K	1	4
012167	Radiometric accuracy (pure polarisation)	K	1	0	9	K	1	3
012168	Radiometric accuracy (cross polarisation)	K	1	0	9	K	1	3
030010	Number of grid points	Numeric	0	0	13	Numeric	0	4
001124	Grid point identifier	Numeric	0	0	24	Numeric	0	8
007012	Grid point altitude	M	2	-50000	20	M	2	7
013048	Water fraction	%	1	0	10	%	1	4
012080	Brightness temperature real part	K	2	-10000	16	K	2	5
012081	Brightness temperature imaginary part	K	2	-10000	16	K	2	5
012082	Pixel radiometric accuracy	K	2	0	12	K	2	4

025081	Incidence angle	Degree	3	0	17	Degree	3	6
025082	Azimuth angle	Degree	3	0	19	Degree	3	6
025083	Faraday rotational angle	Degree	3	0	19	Degree	3	6
025084	Geometric rotational angle	Degree	5	0	26	Degree	5	8
027010	Footprint axis 1	M	-1	0	14	M	-1	5
028010	Footprint axis 2	M	-1	0	14	M	-1	5
025174	SMOS information flag	Flag table	0	0	14	Flag table	0	5
002099	Polarisation	Code table	0	0	3	Code table	0	1
033028	Snapshot overall quality	Code table	0	0	3	Code table	0	1

Note: In full polarisation the Level1c SMOS brightness temperature (BT) is complex number. The components of the complex BT are related to the Stokes parameters which are harmonic components of the brightness temperature. Third and fourth Stoke parameters can be negative, leading to negative values of the complex BT.

Proposed new BUFR Table D sequence for SMOS data

312070 001007
001144
001124
030010
301011
301013
301021
007012
015012
012165
012166
012167
012168
027010
028010
002099
013048
025081
025082
025083
025084
012080
012081
012082
025174
033028

Add new Code tables:

0 33 028
Snapshot overall quality

Code	Meaning
1	Nominal
2	Degraded by SW error; any error reported by the algorithms
3	Degraded by instrument error
4	Degraded by corrupted /missing ADF
5-6	Reserved

7   Missing value

0 02 099
Polarisation

Code   Meaning

0   HH polarisation
1   VV polarisation
2   HV polarisation real valued component
3   HV polarisation imaginary valued component
4-6   Reserved
7   Missing value

Add new Flag table:

0 25 174
SMOS information flag

Bit number   Meaning
    1   Pixel is affected by RFI effects
    2   Pixel is located in the hexagonal Alias direction centred on Sun alias
    3   Pixel is close to the border delimiting the extended Alias free zone
    4   Pixel is inside the extended Alias free zone
    5   Pixel is inside the exclusive of Alias free zone
    6   Pixel is located in a zone where a Moon Alias was reconstructed
    7   Pixel is located in a zone where Sun reflection has been detected
    8   Pixel is located in a zone where Sun Alias was reconstructed
    9   Flat target transformation has been performed during image reconstruction of this pixel
    10   Scene has been combined with an adjustment scene in opposite polarisation during
                 image reconstruction to account for cross-polarisation leakage
    11   Direct Moon correction has been performed during image reconstruction of this pixel
    12   Reflected Sun correction has been performed during image reconstruction of this pixel
    13   Direct Sun correction has been performed during image reconstruction of this image
    All 14   Missing value

Add the following new Sub category in Common Code Table C-13:

Data category   International sub-category

101 Image data (satellite)   007 SMOS data

Add the following new satellite identifier in Common Code Table C-5:

46   SMOS

Add the following new satellite instrument in Common Code Table C-8:

176   ESA   Radiometer   MIRAS   Microwave Imaging Radiometer Using Aperture Synthesis

➢ **GOME Experiment data**

3–10–018   Ozone data
    001007 – Satellite identifier
    005040 – Orbit number
    004001 – Year

004043 – Day of year
004004 – Hour
004005 – Minute
004006 – Second
207002 – Increase scale, reference value and data width
026030 – Measurement integration time
207000 – Cancel increase scale, reference value and data width
005002 – Latitude
006002 – Longitude
033072 – Ozone error
007025 – Solar zenith angle
005022 – Solar azimuth angle
207002 – Increase scale, reference value and data width
015001 – Total ozone
207000 – Cancel increase scale, reference value and data width
008003 - Vertical significance ("0" = surface)
207001 – Increase scale, reference value and data width
010004 – Pressure (terrain)
207000 - Cancel increase scale, reference value and data width
008003 - Vertical significance ("Missing" = Cancel)
008003 - Vertical significance ("2" = Cloud top)
033042 - Type of limit represented by following value ("0" = Exclusive lower limit)
207001 - Increase scale, reference value and data width
007004 – Pressure
207000 – Cancel increase scale, reference value and data width
207002 – Increase scale, reference value and data width
015001 – Total ozone (below cloud top pressure)
207000 – Cancel increase scale, reference value and data width
008003 – Vertical significance ("Missing" = Cancel)
207002 – Increase scale, reference value and data width
020081 – Cloud amount in segment (cloud fraction)
207000 – Cancel increase scale, reference value and data width
020065 – Snow cover
008029 – Remotely-sensed surface type
207004 – Increase scale, reference value and data width
015030 – Aerosol contamination index
207000 – Cancel increase scale, reference value and data width
008075 – Ascending/descending orbit qualifier

Table Reference	Element name	BUFR				CREX		
F X Y		Unit	Scale	Ref. value	Data width	Unit	Scale	Data width
0 26 030	Measurement integration time	Second	2	0	8	Second	2	3
0 33 072	Ozone error	Code table	0	0	5	Code table	0	2

0-33-072   Ozone error

0	Good retrieval
1	Reflectivity out of range
2	Larger Pixels (Number of cross-track pixels less than 32) or backward scans Error
3	Solar zenith angle greater than 88
4	Latitude/longitude out of range
5	Viewing zenith angle or solar zenith angle out of range
6	Step-one process failed in general
7	First guess ozone out of range
8	Too many iterations (exceed 8)

9	Step-one residue calculation failed
10	Step-two process failed in general
11	First guess ozone profile out of range
12	Step-two ozone value out of range
13	Step-two residue calculation failed
14	Step-three process failed in general
15	Polarization Correction Accuracy Alert
16	Radiance or irradiance less or equal to zero
17-30	Reserved
31	Missing

➢ **METOP GOME-2 BUFR Template**

3 22 028

ELEMENT NAME
1 001007 SATELLITE IDENTIFIER
2 002019 SATELLITE INSTRUMENTS
3 004001 YEAR
4 004002 MONTH
5 004003 DAY
6 004004 HOUR
7 004005 MINUTE
8 004006 SECOND
9 005001 LATITUDE (HIGH ACCURACY)
10 006001 LONGITUDE (HIGH ACCURACY)
11 027001 LATITUDE (HIGH ACCURACY)
12 028001 LONGITUDE (HIGH ACCURACY)
13 027001 LATITUDE (HIGH ACCURACY)
14 028001 LONGITUDE (HIGH ACCURACY)
15 027001 LATITUDE (HIGH ACCURACY)
16 028001 LONGITUDE (HIGH ACCURACY)
17 027001 LATITUDE (HIGH ACCURACY)
18 028001 LONGITUDE (HIGH ACCURACY)
19 010001 HEIGHT OF LAND SURFACE
20 014019 SURFACE ALBEDO
21 007025 SOLAR ZENITH ANGLE
22 010080 VIEWING ZENITH ANGLE
23 005023 SUN TO SATELLITE AZIMUTH DIFFERENCE
24 020010 CLOUD COVER (TOTAL)
25 008003 VERTICAL SIGNIFICANCE (SATELLITE OBSERVATIONS)
26 007004 PRESSURE
27 014026 ALBEDO AT THE TOP OF CLOUDS
28 020014 HEIGHT OF TOP OF CLOUD
29 013093 CLOUD OPTICAL THICKNESS
30 105000 DELAYED REPLICATION OF FIVE DESCRIPTORS
31 031001 DELAYED DESCRIPTOR REPLICATION FACTOR
32 007004 PRESSURE
33 007004 PRESSURE
34 008043 ATMOSPHERIC CHEMICAL OR PHISICAL CONSTITUENT TYPE
35 008044 CAS REGISTRY NUMBER
36 015021 INTEGRATED MASS DENSITY

A new category 22 for Chemical and Aerosol sequences is proposed to be used.

➢ **All sky radiance data**

New code table entries

In order to describe the type of clouds from which cloudy radiances are associated, it is necessary to add three new entries to the code table 0-08-003, "Vertical significance (satellite observations)", highlighted in grey as follows:

"Vertical significance (satellite observations)", 0-08-003

Code	Meaning
0	Surface
1	Base of Satellite sounding
2	Cloud Top
3	Tropopause
4	Precipitable water
5	Sounding Radiances
6	Mean Temperatures
7	Ozone
8	Low cloud
9	Med Cloud
10	High cloud
11-62	Reserved
63	Missing value

New sequence descriptors

It is proposed to add three new sequence descriptors to Table D for the encoding of all sky radiance data. These are described below:

Sequence	Number of descriptors	Descriptors / sub-sequences
All sky radiance product main sequence		
310027	12	301071 Product information
		301011 Date
		301013 Time
		301021 Latitude / longitude
		030021 Number of pixels per row
		030022 Number of pixels per column
		010002 Orbit height
		304036 All sky radiance cloud coverage
		002152 Satellite instrument used
		002167 Radiance computational method
		101011 Replication operator
		304035 All sky radiance data
Cloud coverage		
304036	12	020082 Amount of segment cloud free
		008012 Land-Sea Qualifier: Sea
		020082 Amount of segment cloud free (sea)
		008012 Cancel qualifier
		020081 Cloud amount in segment
		008003 Vertical significance: Low cloud
		020081 Cloud amount in segment (low cloud)
		008003 Vertical significance: Mid cloud
		020081 Cloud amount in segment (mid cloud)
		008003 Vertical significance: High cloud
		020081 Cloud amount in segment (high cloud)
		008003 Cancel significance
All sky radiance data		
304035	15	002153 Satellite channel centre frequency
		002154 Satellite channel band width
		012063 Brightness temperature
		008001 Pixel type: clear
		012063 Brightness temperature (clear)

008001 Pixel type: cloudy
012063 Brightness temperature (cloudy)
008001 Cancel type
008003 Vertical significance: low cloud
012063 Brightness temperature (low cloud)
008003 Vertical_significance: mid cloud
012063 Brightness temperature (mid cloud)
008003 Vertical_significance: high cloud
012063 Brightness temperature (high cloud)
008003 Cancel_significance

ANNEX TO PARAGRAPH 2

Amendments to the Manual on Codes separately proposed for RARS data exchange and others have been circulated to the President of CBS for approval through the fast track procedure.

- Chinese new satellite
- Sub-centres of EUMETSAT Operation Centre
- New originating centre/sub centres
- GOSAT

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➢ Common Code Table C-5 for Chinese new satellite

Common code table C-5

Common Code Table:	$(I_6I_6I_6$ for alphanumeric codes		
	(Code Table 0 01 007 in BUFR		
	Code used in GRIB Edition 2		
(EVEN DECILES INDICATE POLAR-ORBITING SATELLITES AND ODD DECILES INDICATE GEOSTATIONARY SATELLITES)			
Code figure for $I_6I_6I_6$	Code figure for BUFR (Code table 0 01 007)	Code figure for GRIB 2	
520	520	520	FY-3A

➢ Common Code Table C-12 for Sub-centres of EUMETSAT Operation Centre

Common code table C-12

ORIGINATING CENTRES C-1 or C-11		SUB-CENTRES _BUFR Edition 3, Octet 5 in Section 1_ _BUFR Edition 4, 0 01 034 and Octets 7-8 in Section1_ _GRIB Edition 1, Octet 26 in Section 1_ _GRIB Edition 2, Octets 8-9 in Section 1_ _CREX Edition 2, ppp in Group Poooooppp of Section 1_	
Code figure	Name	Code figure	Name
00254	EUMETSAT Operation Centre	200	Khabarovsk
		210	Novosibirsk

➢ Common Code Tables C-1, C-11 and C-12 for new originating centre/sub centres

Common Code Table C-1

Common Code Table:			$(F_1F_2$ for alphanumeric codes
			$(F_3F_3F_3$ for alphanumeric codes
			(Code Table 0 in GRIB Edition 1/Code Table 0 01 033 in BUFR
Code figure for F_1F_2	Code figure for $F_3F_3F_3$	GRIB Ed1, Octet 5 in Sec 1/ BUFR Ed3, Octet 6 in Sec 1	
n.a.	204	204	National Institute of Water and Atmospheric Research (NIWA – New Zealand)
n.a.	205 to 209	205 to 209	Reserved for other centres

Common Code Table C-11

CREX Edition2 B 01 035 (5 characters), ooooo in Group Pooooooppp of Section 1	GRIB Edition 2, Octets 6-7 in Section 1/ BUFR Edition 4, 0-01-035 (16 bits), Octets 5-6 in Section 1	
00204	00204	National Institute of Water and Atmospheric Research (NIWA – New Zealand)
00205-00209	00205-00209	Reserved for other centres

Common Code Table C-12

ORIGINATING CENTRES C-1 or C-11		SUB-CENTRES BUFR Edition 3, Octet 5 in Section 1 BUFR Edition 4, 0 01 034 and Octets 7-8 in Section1 GRIB Edition 1, Octet 26 in Section 1 GRIB Edition 2, Octets 8-9 in Section 1 CREX Edition 2, ppp in Group Pooooooppp of Section 1	
Code figure	Name	Code figure	Name
Region III			
00046	Brazilian Space Agency INPE	10	Cachoeira Paulista (INPE)
		11	Cuiaba (INPE)
		12	Brasilia (INMET)
		13	Fortaleza (FUNCEME)
		14	Natal (Navy Hygrog. Centre)
		15	Manaus (SIVAM)
		16	Natal (INPE)
		17	Boa Vista
		18-20	Reserved
00147	COmision Nacional de Actividades Espaciales (CONAE) - Argentina	10	Córdoba
		15	Ushuaia
		20	Marambio
		30	Santiago de Chile
		40	Punta Arenas
		50	Base Presidente Frei
		60	Cotopaxi
Region V			
00002	Melbourne	201	Casey
		203	Davis
		211	Melbourne Crib Point 1
		214	Darwin
		217	Perth
		219	Townsville
		232	Fiji
		235	Noumea
		237	Papeete
		250	Vladivostock
		251	Guam
		252	Honolulu
00069	Wellington (RSMC)	243	Kelburn
00072	Singapore	249	Singapore
00204	National Institute of Water and Atmospheric Research (NIWA – New Zealand)	101	Maupia
		102	Lauder

➢ **Common Code Tables C-5 and C-8 for GOSAT**

Common Code Table C-5

Common Code Table:	($I_6I_6I_6$ for alphanumeric codes (Code Table 0 01 007 in BUFR Code used in GRIB Edition 2		
(EVEN DECILES INDICATE POLAR-ORBITING SATELLITES AND ODD DECILES INDICATE GEOSTATIONARY SATELLITES)			
Code figure for $I_6I_6I_6$	Code figure for BUFR (Code table 0 01 007)	Code figure for GRIB 2	
140	140	140	GOSAT

Common Code Table C-8

Code	Agency	Type	Instrument short name	Instrument long name
516	JAXA	Spectrometer	TANSO-FTS	Thermal and Near infrared Sensor for carbon Observations (TANSO) Fourier Transform Spectrometer (FTS)
517	JAXA	Imager	TANSO-CAI	Thermal and Near infrared Sensor for carbon Observations (TANSO) Cloud and Aerosol Imager (CAI)

ANNEX TO PARAGRAPH 3.1

TERMS OF REFERENCE OF THE CGMS TASK FORCE
ON SATELLITE DATA CODES

(Amended following TFSDC-1, CGMS-36 and CBS-XIV)

Background

The CGMS Task Force on Satellite Data Codes (TFSDC) is established in response to CGMS Actions 34-27 and 34-28 agreed by the Coordination Group for Meteorological Satellites (CGMS) at its thirty-fourth session.

Purpose

The TFSDC is established in order to advise CGMS and WMO on issues related to satellite data representation, identification and handling within the WMO Information System.

Membership and organization

The TFSDC is comprised of experts nominated by CGMS satellite operators, assisted by WMO Secretariat and, as appropriate, by external experts representing user communities.

It will nominate among its Members a Rapporteur and a Chairman.

The Task Force will meet at least once a year, and more if necessary. It will pursue its work by correspondence between its meetings.

The Task Force will interact as appropriate with the CBS Inter-Programme Expert Team on Data Representation and Codes (IPET-DRC), Inter-Programme Expert Team on Metadata and Data Interoperability (IPET-MDI) and Expert Team on GTS-WIS Operations and Implementation (ET-OI), with cross-representation at relevant meetings.

The TFSDC will report annually to the CGMS plenary which will decide on whether to continue the activity in the same way or hand it over to a different structure.

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ANNEX TO PARAGRAPH 3.2

➢ **Additional code table entries for METEOSAT data**

In the Code Table 4.2, Product Discipline 3 – Space products, parameter category 1: quantitative products

Add: Number 18, Parameter = Quality of atmospheric divergence (confidence), Units = %
Add: Number 19, Parameter = Wind speed, Units = ms^{-1}
Add: Number 20, Parameter = Aerosol optical thickness at 0.635 um, Units = none
Add: Number 21, Parameter = Aerosol optical thickness at 0.810 um, Units = none
Add: Number 22, Parameter = Aerosol optical thickness at 1.640 um, Units = none
Add: Number 23, Parameter = Angstrom coefficient, Units = none

Change: Number 14 – 191, Parameter = Reserved
to: Number 24 – 191, Parameter = Reserved

➢ **Coding of synthetic satellite data in GRIB2**

Add new entry in Code Table 4.0: Product Definition Template Number

3   Analysis or forecast at a horizontal level or in a horizontal layer at a point in time
for simulated (synthetic) satellite data

Add the following Product definition template 4.32 - Analysis or forecast at a horizontal level or in a horizontal layer at a point in time for synthetic satellite data

Octet	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	Background generating process identifier (defined by originating centre)
14	Analysis or forecast generating process identified
15-16	Hours of observational data cutoff after reference time (see Note)
17	Minutes of observational data cutoff after reference time (see Note)
18	Indicator of unit of time range (see Code table 4.4)
19-22	Forecast time in units defined by octet 18
23	Number of contributing spectral bands (NB)

Repeat the following 11 octets for each contributing band (nb = 1,NB)
(24+11(nb-1)) - (25+11(nb-1))   Satellite series of band nb (code table defined by originating/generating centre)
(26+11(nb-1)) - (27+11(nb-1))   Satellite number of band nb (code table defined by originating/generating centre)
(28+11(nb-1)) – (29+11(nb-1))   Instrument types of band nb (code table defined by originating/generating centre)
(30 +11(nb-1))   Scale factor of central wave number of band nb
(31+11(nb-1)) - (35+11(nb-1))   Scaled value of central wave number of band nb (units: m^{-1})

Note:

(1)   For "satellite series of band nb", "satellite numbers of band nb" and "instrument types of band nb", 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.

(2)   Hours greater than 65534 will be coded as 65534.

Add new entries in Code Table 4.2, Product discipline 3 — Space products, parameter category 1: Quantitative products

Number	Parameter	Units
14	Cloudy brightness temperature	K
15	Clear-Sky brightness temperature	K
16	Cloudy radiance (with respect to wave number)	W m^{-1} sr^{-1}
17	Clear-Sky radiance (with respect to wave number)	W m^{-1} sr^{-1}

➢ **Addition of sub-category to Common Code Table C-13**

Data Category		Sub-Category	
Code figure	Name	Code figure	Name (corresponding traditional alphanumeric codes are in brackets)
000	Surface data — land	000	Hourly synoptic observations from fixed land stations (SYNOP)
		......	......
		002	Main synoptic observations from fixed land stations (SYNOP)
		011	Special aeronautical observations (SPECI)
		014	Ground-based GPS humidity observations (GPSIWV)
		020	Climatological observations (CLIMAT)
		030	Sferics locations (SFLOC)
		040	Hydrologic reports

➢ **New BUFR descriptors for ATMS data**

Add new Table D entry:

		ATMS (Advanced Technology Microwave Sounder) data
3 10 061	0 01 007	Satellite identifier
	0 01 033	Identification of originating/generating center
	0 02 019	Satellite instruments
	0 02 020	Satellite classification
	3 01 011	Year, Month, Day
	3 01 012	Hour, Minute
	2 07 003	Increase scale and bit width
	0 04 006	Second
	2 07 000	Cancel increase scale and bit width
	0 05 041	Scan line number
	0 05 043	Field of view number
	0 33 079	Granule level quality flags
	0 33 080	Scan level quality flags
	0 33 078	Geolocation quality
	1 15 000	Delayed replication of 15 descriptors

	0 31 002	Extended delayed descriptor replication factor
	3 01 021	Latitude, Longitude (high accuracy)
	2 01 129	Increase bit width
	0 07 002	Height or altitude
	2 01 000	Cancel increase bit width
	0 07 024	Satellite zenith angle
	0 05 021	Bearing or azimuth
	0 07 025	Solar zenith angle
	0 05 022	Solar azimuth
	0 05 042	Channel number
	0 02 153	Satellite channel center frequency
	0 02 154	Satellite channel band width
	0 02 104	Antenna polarization
	0 12 066	Antenna temperature
	0 12 163	Brightness temperature
	0 33 081	Channel data quality flags

Add new Table B entries:

Table Reference	Element name	BUFR				CREX		
F X Y		Unit	Scale	Ref. value	Data width	Unit	Scale	Data width
0 12 066	Antenna temperature	K	2	0	16	C	2	5
0 33 078	Geolocation quality	Code table	0	0	4	Code table	0	2
0 33 079	Granule level quality flags	Flag table	0	0	16	Flag table	0	6
0 33 080	Scan level quality flags	Flag table	0	0	20	Flag table	0	7
0 33 081	Channel data quality flags	Flag table	0	0	12	Flag table	0	4

Add the following new code table entries to existing BUFR/CREX Table B descriptors:

0 02 104 (Antenna polarization)
6   Quasi-horizontal polarization
7   Quasi-vertical polarization

Add new Code/Flag tables for Table B descriptors:

0 33 078 Geolocation quality

Code figure	Meaning
0	Nominal – altitude and Ephemeris data available
1	Missing at most a small gap of altitude and Ephemeris data
2	Missing more than a small gap of altitude and Ephemeris data, but no more than a granule boundary
3	Missing more than a granule boundary of altitude and Ephemeris data
4-14	Reserved

15   Missing

0-33-079 Granule level quality flags

Bit	Meaning
1-5	Reserved
6	The No. 1-No.7 health checks failed
7	The No. 8-No.15 health checks failed
8	The No. 16-No.23 health checks failed
9	The No. 24-No.31 health checks failed
10	The No. 32-No.39 health checks failed
11	The No. 40-No.47 health checks failed
12	The No. 48-No.55 health checks failed
13	The No. 56-No.63 health checks failed
14	The No. 64-No.70 health checks failed
15	Quadratic correction applied to the radiometric transfer function for non-linearity correction
All 16	Missing value

0-33-080 Scan level quality flags

Bit	Meaning
1-6	Reserved
7	Divide-by-zero condition or computation loop failed to converge in the K/Ka and V (KAV) Band PRT
8	Divide-by-zero condition or computation loop failed to converge in the WG Band PRT
9	Divide-by-zero condition or computation loop failed to converge in the K/Ka, V, W, G Band Receiver Shelf PRT K temperature computation
10	Out of range condition for the K/Ka and V Band PRT
11	Out of range condition for the WG Band PRT
12	KAV PRT temperature inconsistency
13	WG PRT temperature inconsistency
14	Time Sequence Error

15   Data Gap - Missing scan(s) preceding the current scan

16   KAV PRT Sufficiency - Insufficient KAV PRT data are available

17   WG PRT Sufficiency - Insufficient WG PRT data are available

18   Space View antenna position error

19   Blackbody antenna position error

All 20 Missing value

0-33-081 Channel data quality flags

Bit   Meaning

1-4   Reserved

5   Moon in Space View

6   Gain Error - The lowest blackbody count is smaller than or equal to the highest space view count in a scan

7   Calibration With Fewer Than Preferred Samples

8   Space View Data Sufficiency Check - Insufficient space view samples are available

9   Blackbody View Data Sufficiency Check - Insufficient blackbody view samples are available

10   Out of range condition for the Space View

11   Space view inconsistency

All 12 Missing value

➢ **Proposal for update to Common Code Tables**

Add the following entry to C-1:

| n.a. | 176 | 176 | U.S. Cooperative Institute for Meteorological Satellite Studies (CIMSS) |

Add the following entry to C-11

| 00176 | 00176 | U.S. Cooperative Institute for Meteorological Satellite Studies (CIMSS) |

Add the following entries to C-12

00176	U.S. Cooperative Institute for Meteorological Satellite Studies (CIMSS)	10	Tromso (Norway)
		11	McMurdo (Antarctica)
		12	Sodankyla (Finland)
		13	Fairbanks (USA)
		14	Barrow (USA)
		15	Rothera (Antarctica)

➤ **New BUFR descriptors for CrIS data**

Add new Table D entry:

		(CrIS (Cross-Track Infrared Sounder) radiance data)
3 10 060	0 01 007	Satellite identifier
	0 01 033	Identification of originating/generating center
	0 02 019	Satellite instruments
	0 02 020	Satellite classification
	3 01 011	Year, Month, Day
	3 01 012	Hour, Minute
	2 07 003	Increase scale and bit width
	0 04 006	Second
	2 07 000	Cancel increase scale and bit width
	3 04 030	Location of satellite platform
	3 01 021	Latitude, Longitude (high accuracy)
	0 07 024	Satellite zenith angle
	0 05 021	Bearing or azimuth
	0 07 025	Solar zenith angle
	0 05 022	Solar azimuth
	0 08 075	Ascending/Descending orbit qualifier
	2 01 133	Increase bit width
	0 05 041	Scan line number
	2 01 000	Cancel increase bit width
	0 05 045	Field of regard number
	0 05 043	Field of view number
	0 05 040	Orbit number
	0 10 001	Height of land surface
	2 01 129	Increase bit width
	0 07 002	Height or altitude
	2 01 000	Cancel increase bit width
	2 02 127	Increase scale
	2 01 125	Increase bit width
	0 21 166	Land fraction
	2 01 000	Cancel increase bit width
	2 02 000	Cancel increase scale
	0 08 012	Land/Sea qualifier
	0 20 010	Cloud cover (total)
	0 20 014	Height of top of cloud
	0 02 165	Radiance type flags
	0 33 075	Scan-level quality flags
	1 07 003	Replicate 7 descriptors 3 times
	0 08 076	Type of band
	0 06 029	Wave number (start of range)
	0 06 029	Wave number (end of range)
	0 25 140	Start channel
	0 25 141	End channel
	0 33 076	Calibration quality flags
	0 33 077	Field of view quality flags
	0 08 076	Type of band ("Missing" = Cancel)
	0 33 078	Geolocation quality
	0 33 003	Quality information
	1 04 000	Delayed replication of 4 descriptors
	0 31 002	Extended delayed descriptor replication factor
	2 01 133	Increase bit width
	0 05 042	Channel number

	2 01 000	Cancel increase bit width
	0 14 044	Channel radiance

Add new Table B entries:

Table Reference F X Y	Element name	BUFR				CREX		
		Unit	Scale	Ref. value	Data width	Unit	Scale	Data width
0 02 165	Radiance type flags	Flag table	0	0	15	Flag table	0	5
0 05 045	Field of regard number	Numeric	0	0	8	Numeric	0	3
0 06 029	Wave number	m^{-1}	1	0	22	m^{-1}	1	7
0 14 044	Channel radiance	$Wm^{-2}sr^{-1}cm^{-1}$	7	-100000	22	$Wm^{-2}sr^{-1}cm^{-1}$	7	7
0 33 075	Scan-level quality flags	Flag table	0	0	13	Flag table	0	5
0 33 076	Calibration quality flags	Flag table	0	0	9	Flag table	0	3
0 33 077	Field-of-view quality flags	Flag table	0	0	19	Flag table	0	7
0 33 078	Geolocation quality	Code table	0	0	4	Code table	0	2

Rename 0 21 166 (ASCAT land fraction) to 0 21 166 (Land fraction)

Add the following new code table entries to existing BUFR/CREX Table B descriptors:

0 08 076 (Type of band)

2   Long-wave infrared
3   Medium-wave infrared
4   Short-wave infrared

Add the following flag tables for new Table B descriptors:

0 02 165 Radiance type flags

Bit	Meaning
1	Clear path
2	Partly cloudy path
3	Cloudy path
4	Apodized
5	Unapodized
6	Reconstructed
7	Cloud cleared
8-14	Reserved
All 15	Missing value

0 33 075 Scan-level quality flags

Bit	Meaning
1	Gap in Raw Data Record (RDR) data detected (i.e., missing scan(s) preceding the current scan)
2	Recorded time is not in sequence (i.e., the scan start time is out of sequence)
3	Lamda monitored calculation cannot be updated (see Note 1)
4	The measured temperatures of any instrument components (e.g., beam-splitter, scan mirror, scan baffle, etc.) are outside the allowable ranges (see Note 2)
5	At least one of the monitored instrument temperatures has drifted more than a specified tolerance value
6-12	Reserved
All 13	Missing value

Note 1: Set to 1 if laser wavelength calculation is invalid due to laser diode bias current and/or laser diode temperature measurements being outside the predetermined allowable ranges. These ranges are tunable. In this case Lamda monitored calculation shall have 1 bit per scan.

Note 2: These temperatures are used to compute the "environmental" contribution to the Internal Calibration Target (ICT) radiances. When this bit is set to 1, the invalid temperatures shall be replaced with the validated temperature values of the ICT.

0 33 076 Calibration quality flags

Bit	Meaning
1	Lunar intrusion on first deep space view (see Note)
2	Lunar intrusion on second deep space view (see Note)
3-8	Reserved
All 9	Missing value

Note: Set to 1 if at least one spectrum in the deep space moving average was invalidated due to a lunar intrusion.

0 33 077 Field-of-view quality flags

Bit	Meaning
1	Degraded SDR quality
2	Invalid SDR quality (see Note 1)
3	Invalid SDR geolocation information
4	Degraded radiometric calibration
5	Invalid radiometric calibration (see Note 2)
6	Degraded spectral calibration
7	Invalid spectral calibration (see Note 3)
8	Fringe count error detected and corrected (see Note 4)
9	Day/night indicator (see Note 5)
10	Invalid RDR data (see Note 6)
11	Significant fringe count error detected (see Note 7)
12	Bit trim failed
13-18	Reserved
All 19	Missing value

SDR = Science Data Record
RDR = Raw Data Record

Note 1: SDR quality is invalid if bit trim failed (see bit 12), or fringe count error detected (see bit 11), or invalid Raw Data Record (RDR) data (see bit 10), or invalid radiometric calibration (see bit 5), or invalid spectral calibration (see bit 7).

Note 2: Radiometric calibration is invalid if radiometric calibration is not performed, or if it is performed with invalid calibration data (e.g., deep space window size = 0).

Note 3: Spectral calibration is invalid if fringe count error detected and corrected (see bit 8), or if Neon calibration is suspect and Lamda monitored calculation cannot be updated (see "Scan-level quality flags" (0-33-075) - bit 3).

Note 4: Set to 0 if no fringe count error was detected (see bit 11), or a fringe count error was detected but it was not corrected.

Note 5: Set to 0 if day (solar zenith angle < 90). Set to 1 if night (solar zenith angle $\geq$ 90).

Note 6: This flag indicates the instrument exhibited operational errors and the associated interferogram(s) is/are excluded from SDR processing.

Note 7: This flag indicates a significant number of fringes have been missed, shifting the interferogram ZPD outside of a window monitored by the instrument, and the interferogram is excluded from SDR processing.

0 33 078 Geolocation quality

Code figure	Meaning
0	Nominal – altitude and Ephemeris data available
1	Missing at most a small gap of altitude and Ephemeris data
2	Missing more than a small gap of altitude and Ephemeris data, but no more than a granule boundary
3	Missing more than a granule boundary of altitude and Ephemeris data
4-14	Reserved
15	Missing

Add the following new entry to Common Code Table C-13:

Under Data Category 021 = Radiances (satellite measured), add the following new International Data Sub-Category entry:

	005	Cross-track infrared sounder

➢ **Updates to BUFR tables in support of the exchange of satellite data**

Add the following Sequence descriptor: 3-40-010 – JASON-2 OGDR data

BUFR	Description	Unit	Scale	Reference	Width
F X Y	**Satellite**				
0 01 007	SATELLITE IDENTIFIER				
0 02 019	SATELLITE INSTRUMENTS				
0 01 096	ACQUISITION STATION IDENTIFIER				
0 25 061	SOFTWARE IDENTIFICATION				
0 05 044	SATELLITE CYCLE NUMBER				
0 05 040	ORBIT NUMBER				
0 01 030	NUMERICAL MODEL IDENTIFIER				
	Datation				
0 04 001	YEAR				
0 04 002	MONTH				
0 04 003	DAY				
0 04 004	HOUR				
0 04 005	MINUTE				
0 04 007	SECONDS WITHIN A MINUTE				
	Location and Surface Type				
0 05 001	LATITUDE (HIGH ACCURACY)				
0 06 001	LONGITUDE (HIGH ACCURACY)				
0 08 029	REMOTELY SENSED SURFACE TYPE				
0 08 074	ALTIMETER ECHO TYPE				
0 08 077	RADIOMETER SENSED SURFACE TYPE				
	Flags				
0 40 011	INTERPOLATION FLAG				

0 25 097	THREE DIMENSIONAL ERROR ESTIMATE OF THE NAVIGATOR ORBIT				
0 25 095	ALTIMETER STATE FLAG				
0 25 098	ALTIMETER DATA QUALITY FLAG				
0 25 099	ALTIMETER CORRECTION QUALITY FLAG				
0 21 144	ALTIMETER RAIN FLAG				
0 25 096	RADIOMETER STATE FLAG				
0 40 012	RADIOMETER DATA QUALITY FLAG				
0 40 013	RADIOMETER BRIGHTNESS TEMPERATURE INTERPRETATION FLAG				
0 21 169	ICE PRESENCE INDICATOR				
0 40 023	*AUXILIARY ALTIMETER STATE FLAGS*	*FLAG TABLE*	*0*	*0*	*5*
0 40 024	*METEOROLOGICAL MAP AVAILABILITY*	*CODE TABLE*	*0*	*0*	*3*
0 40 025	*INTERPOLATION FLAG FOR MEAN DIURNAL TIDE*	*CODE TABLE*	*0*	*0*	*2*
	Altimeter: Ku Band				
0 22 151	KU BAND OCEAN RANGE				
0 22 162	RMS OF 20 Hz KU BAND OCEAN RANGE				
0 22 163	NUMBER OF 20Hz VALID POINTS FOR KU BAND				
0 25 160	KU BAND NET INSTRUMENTAL CORRECTION				
0 25 133	SEA STATE BIAS CORRECTION ON KU BAND				
0 22 156	KU BAND SIGNIFICANT WAVE HEIGHT				
0 22 164	RMS 20 HZ KU BAND SIGNIFICANT WAVE HEIGHT				
0 22 165	NUMBER OF 20HZ VALID POINTS FOR KU BAND SIGNIFICANT WAVE HEIGHT				
0 22 166	KU BAND NET INSTRUMENTAL CORRECTION FOR SIGNIFICANT WAVE HEIGHT				
0 21 137	KU BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 21 138	STD KU BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 22 167	NUMBER OF VALID POINTS FOR KU BAND BACKSCATTER				
0 21 139	KU BAND NET INSTRUMENTAL CORRECTION FOR AGC				
0 21 118	ATTENUATION CORRECTION ON SIGMA-0				
0 21 145	KU BAND AUTOMATIC GAIN CONTROL				
0 21 146	RMS KU BAND AUTOMATIC GAIN CONTROL				

0 21 147	NUMBER OF VALID POINTS FOR KU BAND AUTOMATIC GAIN CONTROL				
	Altimeter: C band				
0 22 168	C BAND OCEAN RANGE				
0 22 169	RMS OF C BAND OCEAN RANGE				
0 22 170	NUMBER OF 20Hz VALID POINTS FOR C BAND				
0 25 161	C BAND NET INSTRUMENTAL CORRECTION				
0 25 162	SEA STATE BIAS CORRECTION ON C BAND				
0 22 171	C BAND SIGNIFICANT WAVE HEIGHT				
0 22 172	RMS 20HZ C BAND SIGNIFICANT WAVE HEIGHT				
0 22 173	NUMBER OF 20HZ VALID POINTS FOR C BAND SIGNIFICANT WAVE HEIGHT				
0 22 174	C BAND NET INSTRUMENTAL CORRECTION FOR SIGNIFICANT WAVE HEIGHT				
0 21 170	C BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 21 171	RMS C BAND CORRECTED OCEAN BACKSCATTER COEFFICIENT				
0 22 175	NUMBER OF VALID POINTS FOR C BAND BACKSCATTER				
0 21 172	C BAND NET INSTRUMENTAL CORRECTION FOR AGC				
0 21 118	ATTENUATION CORRECTION ON SIGMA-0				
0 21 173	C BAND AUTOMATIC GAIN CONTROL				
0 21 174	RMS C BAND AUTOMATIC GAIN CONTROL				
0 21 175	NUMBER OF VALID POINTS FOR C BAND AUTOMATIC GAIN CONTROL				
	Radiometer				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 02 153	SATELLITE CHANNEL CENTRE FREQUENCY				
0 12 063	BRIGHTNESS TEMPERATURE				
0 13 090	RADIOMETER WATER VAPOR CONTENT				
0 13 091	RADIOMETER LIQUID CONTENT				
	Wind				
0 07 002	HEIGHT OR ALTITUDE				

0 11 097	WIND SPEED FROM ALTIMETER				
0 11 098	WIND SPEED FROM RADIOMETER				
0 07 002	HEIGHT OR ALTITUDE				
0 11 095	U COMPONENT OF THE MODEL WIND VECTOR				
0 11 096	V COMPONENT OF THE MODEL WIND VECTOR				
	Dynamic Topography				
0 10 096	MEAN DYNAMIC TOPOGRAPHY				
0 10 081	ALTITUDE OF COG ABOVE REFERENCE ELLIPSOID				
0 10 082	INSTANTANEOUS ALTITUDE RATE				
0 10 083	OFF NADIR ANGLE OF THE SATELLITE FROM PLATFORM DATA				
0 10 101	SQUARED OFF NADIR ANGLE OF THE SATELLITE FROM WAVEFORM DATA				
0 25 132	IONOSPHERIC CORRECTION FROM MODEL ON KU BAND				
0 25 163	ALTIMETER IONOSPHERIC CORRECTION ON KU BAND				
025 126	MODEL DRY TROPOSPHERIC CORRECTION				
0 25 128	MODEL WET TROPOSPHERIC CORRECTION				
0 25 164	RADIOMETER WET TROPOSPHERIC CORRECTION				
0 10 085	MEAN SEA SURFACE HEIGHT				
0 10 097	MEAN SEA SURFACE HEIGHT FROM ALTIMETER ONLY				
0 10 086	GEOID'S HEIGHT				
0 10 087	OCEAN DEPTH/LAND ELEVATION				
0 10 092	SOLID EARTH TIDE HEIGHT				
0 10 088	GEOCENTRIC OCEAN TIDE HEIGHT SOLUTION 1				
0 10 089	GEOCENTRIC OCEAN TIDE HEIGHT SOLUTION 2				
0 10 098	LOADING TIDE HEIGHT GEOCENTRIC OCEAN TIDE SOLUTION 1				
0 10 099	LOADING TIDE HEIGHT GEOCENTRIC OCEAN TIDE SOLUTION 2				
0 10 090	LONG PERIOD TIDE HEIGHT				
0 10 100	N0N-EQUILIBRIUM LONG PERIOD TIDE HEIGHT				
0 10 093	GEOCENTRIC POLE TIDE HEIGHT				
0 25 127	SEA SURFACE HEIGHT CORRECTION DUE TO PRESSURE LOADING				
0 40 014	HIGH FREQUENCY FLUCTUATIONS OF THE SEA SURFACE TOPOGRAPHY CORRECTION				
0 10 102	*SEA SURFACE HEIGHT ANOMOLY*	*M*	*3*	*-32768*	*16*

Add the following code and flag tables

0 40 023

Auxiliary altimeter state flags

Bit number
1	Band sequence (0 = 3Ku_1C_3Ku, 1 = 2Ku_1C_2Ku
2	C band frequency (0 = 320 MHz, 1 = 100 MHz)
3	C band status (0 = On, 1 = Off)
4	Ku band status (0 = On, 1 = Off)
All 5 bits	Missing

0 40 024

Meteorological map availability

Code figure
0	2 maps available (6 hours apart)
1	2 maps available (> 6 hours apart)
2	1 map available; data extrapolated
3	No maps used
4 to 6	Reserved
7	Missing value

0 40 025

Interpolation flag for mean diurnal tide

Code figure
0	Good
1	Bad
2	Reserved
3	Missing value

It is further proposed that a note is added to Table D, Class 40, recommending that 3-40-010 is to be used in preference to 3-40-005.

Proposals for refinement of IASI data encoding arising from validation activities

a) Add a section to the 3-40-008 sequence for the inclusion of principal component scores with selected channels
b) Deprecate the sequence 3-40-006 originally intended for the representation of IASI principal component scores
c) Add to sequence 3-40-008 a database identification (0-25-062) descriptor for the specification of eingenvalue data sets used for the principal component analysis
d) Correct the proposed definition of 0-40-016 (Residual RMS in band) to be: numeric, scale 3, offset 0, width 14 bits

The updated sequence for 3-40-008 is given below:

IASI sequence combining PC scores, channel selection and enhanced data (to be 3-40-008)

Satellite processing information

0-01-007   Satellite identifier

0-01-031	Identification of originating/generating centre
0-02-019	Satellite instruments
0-02-020	Satellite classification
	Date and time
0-04-001	Year
0-04-002	Month
0-04-003	Day
0-04-004	Hour
0-04-005	Minute
2-02-131	Add 3 to scale
2-01-138	Add 10 to width
0-04-006	Second
2-01-000	Reset width
2-02-000	Reset scale
	Location information
0-05-001	Latitude (high accuracy)
0-06-001	Longitude (high accuracy)
0-07-024	Satellite zenith angle
0-05-021	Bearing or azimuth
0-07-025	Solar zenith angle
0-05-022	Solar azimuth
0-05-043	Field of view number
0-05-040	Orbit number
2-01-133	Add 5 to width
0-05-041	Scan line number
2-01-000	Reset width
2-01-132	Add 4 to width
0-25-070	Major frame count
2-01-000	Reset width
2-02-126	Subtract 2 from scale
0-07-001	Height of station
2-02-000	Reset scale
	Quality information
1-03-003	Repeat next 3 descriptor 3 times
0-25-140	Start channel
0-25-141	End channel
0-33-060	GqisFlagQual
0-33-061	GqisQualIndex
0-33-062	GqisQualIndexLoc
0-33-063	GqisQualIndexRad
0-33-064	GqisQualIndexSpect
0-33-065	GqisSysTecSondQual
0-40-020	GqisFlagQualDetailed - Quality flag for the system
	IASI subset of channels
1-01-010	Repeat next 1 descriptor 10 times
3-40-002	IASI Level 1c band description
1-04-000	Delayed replication of next 4 descriptors
0-31-002	Extended delayed replication factor
2-01-136	Add 8 to width
0-05-042	Channel number
2-01-000	Reset width
0-14-046	Scaled IASI radiance
	Instrument band definition
1-08-003	Repeat next 8 descriptors 3 times
0-25-140	Start channel
0-25-141	End channel

0-40-015	Quantization factor
0-40-016	Residual RMS in band
0-25-062	Database indentification
	Principal component scores for band
1-01-000	Delayed replication of one descriptor
0-31-002	Extended delayed replication factor
0-40-017	Non-normalised principal component score
	AVHRR scene analysis
0-02-019	Satellite instruments
0-25-051	AVHRR channel combination
1-01-007	Repeat next 1 descriptor 7 times
3-40-004	IASI Level 1c AVHRR single scene sequence
0-20-081	Cloud amount in segment
0-08-029	Remotely sensed surface type
0-20-083	Amount of segment covered by scene
0-08-029	Remotely sensed surface type
0-40-018	Average of imager measurements
0-40-019	Variance of imager measurements
0-40-021	Fraction of weighted AVHRR pixel in IASI FOV covered with snow/ice
0-40-022	Number of missing, bad or failed AVHRR pixels

Proposal for a normalised differential vegetation index (NDVI) sequence

Add the following (*new entries in italics and underlined*):

Sequence descriptor: 3-40-009 – Normalised differential vegetation index (NDVI)

0-01-007	Satellite identifier
0-01-031	Generating centre
0-02-019	Satellite instrument
0-02-020	Satellite classification
3-01-011	Date
3-01-013	Time
0-05-040	Orbit number
2-01-136	Add 8 bits to width of next descriptor
0-05-041	Scan linen umber
2-01-000	Reset descriptor width
0-25-071	Frame count
0-05-001	Latitude (high accuracy)
0-05-001	Latitude (high accuracy)
0-06-001	Longitude (high accuracy)
0-06-001	Longitude (high accuracy)
1-07-064	Repeat next 7 descriptors 64 times
1-06-032	Repeat next 6 descriptors 32 times
0-08-012	Land/sea qualifier
0-08-013	Day/night qualifier
0-08-065	Sun-glint indicator
0-08-072	Pixel(s) type
0-13-039	Terrain type (ice/snow)
0-40-015	*Normalised differential vegetation index (NDVI)*

Element descriptor:
Table B entry: 0-40-015
Name: Normalised differential vegetation index (NDVI)
Units: Numeric
Scale: 2

Reference: -100
Width: 8

The NDVI values can (theoretically) range from -1 to 1.
The proposed descriptor allows values from -1.00 to 1.54, with a precision of 0.01.

Proposed addition of code table entry for twilight

Update this to be as follows:
0-08-013   *Day/Night qualifier*
Code Figure
0   Night
1   Day
2   Twilight
3   Missing value