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| WORLD METEOROLOGICAL ORGANIZATION  COMMISSION FOR BASIC SYSTEMS  -----------------------------  SECOND MEETING OF  INTER-PROGRAMME EXPERT TEAM ON CODES MAINTENANCE  OFFENBACH, GERMANY, 28 MAY - 1 JUNE 2018 |  | IPET-CM-II / Doc. 2.4 (3)  (29. 5. 2018)  -------------------------  ITEM 2.4  ENGLISH ONLY |

BUFR

**BUFR descriptors for IASI Level 2 products**

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**Summary and Purpose of Document**

This document proposes new entries to BUFR tables B in order to encode IASI Level 2 satellite products produced at EUMETSAT.

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**ACTION PROPOSED**

The meeting is requested to approve the contents for inclusion within the next update to the WMO Manual on Codes.

**DISCUSSIONS**

EUMETSAT has produced Level 2 satellite products encoded in BUFR from observations made with the IASI instrument for more than a decade. These observations contribute greatly to the quality of numerical weather prediction and climate monitoring. Historically, several local descriptors have been used in order to encode portions of these data. Most of these are mission-specific quality flags.

Because these flags can be important for product interpretation, EUMETSAT wishes to register them as entries to the Manual on Codes so that it is no longer necessary to encode them with local descriptors. This should make it easier for users to interpret the data. It is thus proposed to add the following elements to the Manual on Codes, BUFR Table B.

**PROPOSAL**

***“Amend”, “add”, “delete” are the keywords***

*Add* the following elements to BUFR Table B/40:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Descriptor** | **Name** | **Units** | **Scale** | **Reference** | **Width** |
| 0-40-043 | Satellite manoeuvre indicator | Code table | 0 | 0 | 3 |
| 0-40-044 | Dust index | Numeric | 1 | 0 | 8 |
| 0-40-045 | Cloud formation and height assignment | Flag table | 0 | 0 | 5 |
| 0-40-046 | Cloudiness summary | Code table | 0 | 0 | 3 |
| 0-40-047 | Validation flag for IASI or IASI-NG level 1 product | Code table | 0 | 0 | 3 |
| 0-40-048 | Validation flag of AMSU-A level 1 data flow | Code table | 0 | 0 | 3 |
| 0-40-049 | Cloud tests executed and results | Flag table | 0 | 0 | 16 |
| 0-40-050 | Retrieval initialisation | Flag table | 0 | 0 | 8 |
| 0-40-051 | Convergence of the iterative retrieval | Code table | 0 | 0 | 3 |
| 0-40-052 | Indication of super-adiabatic and super-saturation in final retrieval | Flag table | 0 | 0 | 8 |
| 0-40-053 | Number of iterations used for retrieval | Numeric | 0 | 0 | 8 |
| 0-40-054 | Potential processing and inputs errors | Flag table | 0 | 0 | 13 |
| 0-40-055 | Diagnostics on the retrieval | Flag table | 0 | 0 | 21 |
| 0-40-056 | General retrieval quality | Code table | 0 | 0 | 3 |
| 0-40-057 | IASI level 2 retrieval flags | Flag table | 0 | 0 | 31 |
| 0-40-058 | Number of vectors describing the characterization matrices | Numeric | 0 | 0 | 8 |
| 0-40-059 | Number of layers actually retrieved | Numeric | 0 | 0 | 8 |
| 0-40-060 | Number of profiles retrieved in scanline | Numeric | 0 | 0 | 8 |
| 0-40-061 | Air partial columns on each retrieved layer | mol / cm² | 3 | 0 | 16 |
| 0-40-062 | A-priori partial columns on each retrieved layer | mol / cm² | 10 | 0 | 16 |
| 0-40-063 | Scaling vector multiplying the a priori CO vector in order to define the retrieved CO vector | Numeric | 5 | 0 | 26 |
| 0-40-064 | Main eigenvalues of the sensitivity matrix | Numeric | 6 | 0 | 31 |
| 0-40-065 | Main eigenvectors of the sensitivity matrix | Numeric | 6 | -1000000000 | 31 |
| 0-40-066 | Quality indicator for atmospheric water vapour | Numeric | 1 | 0 | 8 |
| 0-40-067 | Quality indicator for atmospheric temperature | Numeric | 1 | 0 | 8 |
| 0-40-068 | General retrieval quality flag for SO2 | Code table | 0 | 0 | 4 |
| 0-40-069 | PWLR estimated retrieval error for surface air temperature | K | 4 | -1000000 | 21 |
| 0-40-070 | PWLR estimated retrieval error of surface dew point | K | 4 | -1000000 | 21 |
| 0-40-071 | Retrieval error covariance matrix for ozone in principal component domain | Numeric | 4 | -1000000 | 21 |
| 0-40-072 | PWLR estimated retrieval quality indicator of atmospheric ozone | Numeric | 1 | 0 | 8 |
| 0-40-073 | PWLR estimated retrieval error of surface skin temperature | K | 1 | 0 | 8 |

\* PWLR stands for Piece-Wise Linear Regression-cube and is a first guess optimal estimation method.

*Add* the following associated code table:

0-40-043 Satellite manoeuvre indicator

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | The platform is not undergoing a manoeuvre |
| 1 | The platform is undergoing a manoeuvre, nominal processing |
| 2 | The platform is undergoing a manoeuvre, no processing |
| 3-6 | Reserved |
| 7 | Missing value |

*Add* the following associated flag table:

0-40-045 Cloud formation and height assignment

|  |  |
| --- | --- |
| ***Bit No*** | ***Description*** |
| 1 | Cloud products retrieved with the χ2 method. |
| 2 | Cloud products retrieved with the CO2-slicing. |
| 3 | Height assignment performed with statistical first guess retrieval. |
| 4 | Height assignment performed with NWP forecasts. |
| All 5 | Missing value. |

*Add* the following associated code table:

0-40-046 Cloudiness summary

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | The IASI IFOV is clear |
| 1 | Small cloud contamination possible |
| 2 | The IASI IFOV is partially covered by clouds |
| 3 | High or full cloud coverage |
| 4-6 | Reserved |
| 7 | Missing value |

*Add* the following associated code table:

0-40-047 Validation flag for IASI or IASI-NG level 1 product

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | The measurements and side information are available and of good quality for L2 processing |
| 1 | The L1c products are of degraded quality according to L1c flags, no L2 processing. |
| 2 | Quality control indicates that the L1c data are of degraded quality (not indicated by the IASI L1c flags), no L2 processing. |
| 3-6 | Reserved |
| 7 | Missing value |

*Add* the following associated code table:

0-40-048 Validation flag of AMSU-A level 1 data flow

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | The expected AMSU measurements are available, of good quality and collocated with IASI for processing. |
| 1 | AMSU-A data are available but of degraded quality (according to AMSU L1 flags or QC tests) and not used for processing. |
| 2 | No coincident (time and space) AMSU measurements available for processing. |
| 3-6 | Reserved |
| 7 | Missing value |

*Add* the following associated flag table:

0-40-049 Cloud tests executed and results

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1-3 | Reserved |
| 4 | IASI cloud optical thickness indicates a cloud. |
| 5 | IASI cloud optical thickness computed. |
| 6 | AVHRR heterogeneity test indicates a cloud. |
| 7 | AVHRR heterogeneity test executed. |
| 8 | IASI-AVHRR ANN cloud test indicates a cloud. |
| 9 | IASI-AVHRR ANN cloud test executed. |
| 10 | AVHRR integrated cloud fraction indicates a cloud. |
| 11 | AVHRR integrated cloud fraction assessed. |
| 12 | AMSU cloud test indicates a cloud. |
| 13 | AMSU cloud test executed. |
| 14 | IASI Window cloud test indicates a cloud. |
| 15 | IASI Window cloud test executed. |
| All 16 | Missing value |

*Add* the following associated flag table:

0-40-050 Retrieval initialisation

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1-4 | Reserved |
| 5 | MHS included |
| 6 | AMSU included |
| 7 | IASI included |
| All 8 | Missing value |

*Add* the following associated code table:

0-40-051 Convergence of the iterative retrieval

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | OEM not attempted |
| 1 | OEM aborted because first guess residuals too high |
| 2 | The minimisation did not converge, sounding rejected |
| 3 | The minimisation did not converge, sounding accepted |
| 4 | The minimisation converged but sounding rejected |
| 5 | The minimisation converged, sounding accepted |
| 6 | Reserved |
| 7 | Missing value |

*Add* the following associated flag table:

0-40-052 Indication of super-adiabatic and super-saturation in final retrieval

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1-3 | Reserved |
| 4 | Supersaturation conditions in the OEM retrieval |
| 5 | Superadiabatic conditions in the OEM retrieval |
| 6 | Supersaturation conditions in the first guess |
| 7 | Superadiabatic conditions in the first guess |
| All 8 | Missing value |

*Add* the following associated flag table:

0-40-054 Potential processing and inputs errors

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1 | An error has been detected |
| 2 | Message from L1 |
| 3 | Message from L2 |
| 4 | Message from ancillary data |
| 5 | Message from fitting procedure |
| 6 | File opening |
| 7 | File reading |
| 8 | Quality flag |
| 9 | Level 2 "from linear regression"(F\_Qual), report a pixel where L2 are not fully trusted |
| 10 | Empty field or data |
| 11 | Missing surface pressure value |
| 12 | Radiance filtering |
| All 13 | Missing value |

*Add* the following associated flag table:

0-40-055 Diagnostics on the retrieval

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1 | Radiance filtering |
| 2 | Polar regions |
| 3 | Location in the night |
| 4 | Negative altitude Surface below m.s.l. |
| 5 | Cloud covered scene |
| 6 | Scene above the sea |
| 7 | Scene above desert |
| 8 | Skin temperature |
| 9 | Skin temperature differential |
| 10 | Spectral line contrast too weak |
| 11 | Maximum number of iterations exceeded |
| 12 | Negative partial columns |
| 13 | Matrix ill conditioned |
| 14 | Fit diverged |
| 15 | Error in gsl usage |
| 16 | Residuals “biased” |
| 17 | Residuals “sloped” |
| 18 | Residuals rms large |
| 19 | Weird averaging kernels |
| 20 | Ice presence detected |
| All 21 | Missing value |

*Add* the following associated code table:

0-40-056 General retrieval quality

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | Use not recommended |
| 1 | Use with caution |
| 2 | Best quality |
| 3-6 | Reserved |
| 7 | Missing value |

*Add* the following associated flag table:

0-40-057 IASI level 2 retrieval flags

|  |  |
| --- | --- |
| ***Bit No.*** | ***Description*** |
| 1 | An error has been detected |
| 2 | Message from L1 |
| 3 | Message from L2 |
| 4 | Message from ancillary data |
| 5 | Message from fitting procedure |
| 6 | Reserved |
| 7 | Bad L1 or L2 flag raised |
| 8 | Level 2 not fully trusted |
| 9 | Missing temperature or humidity levels in the vertical profile |
| 10 | Missing surface pressure value |
| 11 | Radiance filtering |
| 12 | Polar regions |
| 13 | Location in the night |
| 14 | Negative altitude |
| 15 | Cloud covered scene |
| 16 | Scene above the sea |
| 17 | Scene above desert |
| 18 | Missing skin temperature |
| 19 | Retrieved skin temperature too different from model |
| 20 | Spectral line contrast too weak |
| 21 | Maximum number of iterations exceeds |
| 22 | Negative partial columns |
| 23 | Matrix ill conditioned |
| 24 | Fit diverged |
| 25 | Error in GSL usage |
| 26 | Residuals biased |
| 27 | Residuals sloped |
| 28 | Residuals RMS large |
| 29 | Weird averaging kernels |
| 30 | Ice presence detected |
| All 31 | Missing |

*Add* the following associated code table:

0-40-068 General retrieval quality flag for SO2

|  |  |
| --- | --- |
| ***Code Figure*** | ***Description*** |
| 0 | Values calculated with IASI L2 |
| 1 | Pressure and temperature profiles missing in IASI L2 data; model / forecast data used instead |
| 2 | Best quality |
| 3-14 | Reserved |
| 15 | Missing value |

*Add* the following entry to Code Table 0 31 021 Associated field significance:

0-31-021 Associated field significance

|  |  |  |
| --- | --- | --- |
| ***Code Figure*** | ***Associated field*** | ***Quality of data*** |
| 9 | Status of ancillary data | 0 = Data present, good, collocated |
|  |  | 1 = Data available but of degraded quality and not used |
|  |  | 2 = No spatiotemporally collocated data available |
|  |  | 3-14 = Not used (reserved) |
|  |  | 15 = Missing value |