

# ***EPS-SG 3MI Level 1C Product Format Specification***

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***Document Change Record***

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| V2B draft               | 2017-xx-xx  | TBW               | Issue for PDAP PDR:<br>Update of group naming in line with GPFS v2A <ul style="list-style-type: none"> <li>• Status/Instrument Status -&gt; status/instrument</li> <li>• Status/Processing Status -&gt; status/processing</li> <li>• Status/Satellite Status -&gt; status/satellite</li> <li>• All group names lower case and blanks replaced by "_".</li> </ul> Deleted radiance_Q/U variables from r_0763, r_0765 and r_0910 subgroups.  |

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| V3                      | 2017-09-25  |                | <p>Updated variables for geometrical angles fitting</p> <p>Added variables for satellite and solar zenith angle and relative azimuth angle</p> <p>Added attribute 'overlap_average_time_utc' to group /data/overlap_xxx</p> <p>Added variable 'surface_height' to group /data/overlap_xxx/geolocation_data</p> <p>Renamed some of the dimensions of group /data/overlap_xxx</p> <p>Variables vii_scene_inhomogeneity, vii_cloud_fraction, vii_cloud_top_height of group /data/overlap_xxx/geolocation_data are both given as co-located to the single VNIR views and directly to the co-registration grid</p> <p>Variables land_fraction and snow_ice_fraction of group /data/overlap_xxx/geolocation_data are only given as co-located directly to the co-registration grid</p> <p>New estimate of the product size per orbit</p> |
| V3A                     | 2018-03-08  | EPSSG_DCR_860  | <p>Added attributes l1b_start_time_utc and l1b_stop_time_utc to overlap_xxx group (sec. 4.5.3.1)</p> <p>Editorial changes after review</p> <p>EPSSG_DCR_860</p>  |
| V3B                     | 2019-04-17  | EPSSG_DCR_1221 | <p>Update wrt to the V3B of OGS</p> <p>Addition of processing flags</p>  |
| V3C                     | 2019-05-29  | EPSSG_DCR_1340 | <p>Update of Table 23</p>  |

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## 1 INTRODUCTION

### 1.1 Purpose and Scope

This document describes the Format Specification for EPS-SG Multi-Viewing, -Polarisation, -Spectral Image (3MI) Level 1C products generated centrally by the EPS-SG Ground Segment at the EUMETSAT Headquarters. It specifies the detailed format of the 3MI Level 1C products in agreement with the format and naming conventions set out in the Generic Product Format Specification [GPFS] applicable to all EPS-SG products.

This document addresses the native format of the products generated in the EPS-SG Ground Segment, which is netCDF-4 as specified in [GPFS]. Other user formats will be specified elsewhere.

The instrument specific Product Format Specification contains all the instrument specific netCDF details, including specific metadata. The common groups and metadata are defined in the [GPFS].

### 1.2 Relation to other documents

The EPS-SG 3MI Level 1C Product Format Specification [3MI-L1C-PFS] is a System document in the System Specification Tree. It is called up in [SRD], [OGSRD], 3MI Level 1C Product Generation Specification [3MI-L1C-PGS], and EPS-SG System and Ground Segment documents including ICDs/IRDs wishing to convey information about the 3M Level 1C products format and content.

This document is derived from and compliant to [GPFS] for generic product format and naming conventions applicable to all EPS-SG products.

### 1.3 Applicable Documents

| ID       | Title  | Reference and version       |
|----------|--|-----------------------------|
| [GPFS]   | EPS-SG Generic Product Format Specification (GPFS)                                       | EUM/LEO-EPSSG/SPE/13/702108 |
| [MCSD]   | EPS-SG Mission Conventions and Standards Document  | EUM/LEO-EPSSG/STD/14/745221 |
| [DEV]    | Development Logic for EPS-SG L0-L1-L2 Processing Specifications                          | EUM/LEO-EPSSG/TEN/14/763159 |
| [HQ-BAS] | EPS-SG Data and Products Generation, Archiving and Dissemination Baseline at EUMETSAT HQ | EUM/LEO-EPSSG/SPE/15/819557 |

### 1.4 Reference Documents

| ID      | Title   | Reference                   |
|---------|---|-----------------------------|
| [SRD]   | EPS-SG System Requirements Document                 | EUM/LEO-EPSSG/SPE/13/735903 |
| [OGSRD] | EPS-SG Overall Ground Segment Requirements Document | EUM/LEO-EPSSG/REQ/13/725156 |

|               |  |                             |
|---------------|--|-----------------------------|
| [3MI-L1C-PGS] | EPS-SG Multi-View, -Polarisation, -Spectral Imager (3MI) Level 1C Product Generation Specification | EUM/LEO-EPSSG/SPE/15/794907 |
|---------------|--|-----------------------------|

## 1.5 Acronyms

The definition of conventions, terms and abbreviations applicable to the EPS-SG programme can be found in [MCSD]. Abbreviations specific to this document are listed in the following table.

| Acronym | Definition  |
|---------|---|
| AOI     | Area Of Interest  |
| EPS-SG  | EUMETSAT Polar System – Second Generation                           |
| 3MI     | Multi-Directional, Multi-Polarisation and Multi-Spectral Instrument |
| netCDF  | Network Common Data Language  |
| NRT     | Near Real Time  |
| TBC     | To Be Confirmed   |
| TBD     | To Be Defined   |
| TBW     | To Be Written   |
| UTC     | Universal Time Coordinated  |
| WMO     | World Meteorological Organization                                   |
| XML     | eXtensible Markup Language  |
| XSD     | XML Schema Definition   |

## 1.6 Conventions and Terminology

Generic conventions and terminology used in this document for EPS-SG products are those described in the [GPFS]. Generic terms and definitions applicable to the EPS-SG Programme can be found in [MCSD].

### 1.6.1 Meaning of Table Headings

| Element Name               | Description   |
|----------------------------|---|
| <b>Filename</b>            | The name of the product (following naming convention described in [GPFS])   |
| <b>Product ID</b>          | The Product identifier of the product (global attribute: Productidentifier as described in the [GPFS])                            |
| <b>Product Description</b> | A summary as defined in the relevant product format specification (global attribute: product description described in the [GPFS]) |
| <b>Format</b>              | Native format of the product (i.e. netCDF-4)  |
| <b>Size</b>                | Estimated size of the product (MByte/Orbit)   |
| <b>Duration</b>            | Duration of product disseminated to the user (to be defined during Phase C)   |
| <b>Group Name</b>          | The name of the NetCDF group  |
| <b>Variable Name</b>       | The name of NetCDF variable   |

|                          |   |
|--------------------------|---|
| <b>Attribute Name</b>    | The name of NetCDF attribute (see also <a href="http://www.unidata.ucar.edu/software/netcdf/docs/netcdf/Attribute-Conventions.html">http://www.unidata.ucar.edu/software/netcdf/docs/netcdf/Attribute-Conventions.html</a> )<br><br>Attributes may be global or related to a group instead of a variable; in this case they must appear before dimensions |
| <b>Dimension Name</b>    | The name of NetCDF dimension  |
| <b>Description</b>       | Description of the element; for a variable the description must coincide with its “long_name” attribute   |
| <b>Range or value</b>    | Range or value of variables, or value of dimensions or attributes, must match the “valid_min”, “valid_max”, or “valid_range” attributes   |
| <b>Unit</b>              | Unit type of variables or attributes, must coincide with “units” attribute.   |
| <b>Data Type or Type</b> | Type of variables or attributes as defined in NetCDF Users Guide, not used for dimensions   |
| <b>Dimension</b>         | Dimensions of the variables or attributes, in the same order as storage and with one dimension per line. Dimensions must be always defined before variables   |
| <b>Usage</b>             | Usage of the product: <ul style="list-style-type: none"> <li>- Internal: Product/Data is for use within the EPS-SG system. It is not made available to the end-users</li> <li>- User: the product is disseminated to the end-users</li> </ul>   |

## 1.7 Document structure

| Section Number | Title   | Content  |
|----------------|---|--|
| 1              | Introduction                                  | The Scope and Purpose of the PFS document is described in this section, along with Open Issues, Assumptions, Applicable and Reference documents                                |
| 2              | Overview of the instrument: 3MI               | A description of the main features and characteristics of the 3MI is provided in this section  |
| 3              | EPS-SG 3MI Level 1C Products Overview         | A high-level overview of the 3MI Level 1C radiance products structure is presented in this section. The Product Tree and the Product Naming convention are also specified here |
| 4              | EPS-SG 3MI Level 1C Product Detailed Format   | The format of the 3MI Level 1C radiance product (detailed description of the NetCDF Data Files of each product) is described in this section                                   |
| 5              | Product Format Version Control                | This section is aimed to describe the product format version control number for each product described in this document  |
| APP A          | Size of 3MI-1C-RAD product                    | In this section the size of each 3MI Level 1C radiance products is provided  |
| APP B          | XML Description of 3MI-1C-RAD Products Format | The .xml schemas for the 3MI Level 1C radiance product is provided in this section   |

## **2 OVERVIEW OF THE INSTRUMENT: 3MI**

A description of the main features and characteristics of the 3MI is provided in [3MI-L1C-PGS] which also describes in detail the acquisition modes generating data to be processed in the Ground Segment.

### 3 EPS-SG 3MI LEVEL 1C PRODUCTS OVERVIEW

The 3MI Level 1C radiance product is generated centrally by the EPS-SG Ground Segment at the EUMETSAT Headquarters.

#### 3.1 Product List

| Product ID | Product Description                                 | Usage           |
|------------|---|-----------------|
| 3MI-1C-RAD | 3MI Level 1C Top of Atmosphere Spectral Reflectance | Global/Regional |

*Table 1: EPS-SG 3MI Level 1C Product List*

#### 3.2 Naming Convention

The naming convention of EPS-SG products complies with the naming convention specified in [GPFS] for all EPS-SG Ground Segment products generated in native format.

Example product name (for illustrative purpose only):

**W\_xx-eumetsat-darmstadt,SAT,SGA1-3MI-1C-RAD\_C\_EUMT\_20220101121212\_G\_O\_20220101103000\_20220101104000\_O\_N\_\_nc**

This is a L1C operational product, generated in the context of the EPS-SG Global mission, for the Multi-view, Multi-polarisation, Multi-spectral Imager (3MI mission) embarked on the Metop-SG/A1 satellite (SGA1).

The product was created on the 01 January 2022 at 12:12:12 hours, with a sensing start date of 01 January 2022 at 10:30:00 hours and a sensing end date of 01 January 2022 at 10:40:00 hours. The file was generated in the Ground Segment operational (O) environment. The disposition mode indicates that it was produced during routine operations (O), in NRT processing (N).

#### 3.3 Overall Structure of EPS-SG Products

All EPS-SG product types generated by the EPS-SG Ground Segment are NetCDF-4 files complying with the generic structure and data model set out in the [GPFS]. Their high-level structure consists of a *root* group, holding global attributes defined in the [GPFS] and the following sub-groups: *status*, *data* and *quality*. In the following sections the physical composition is specified for the 3MI L1C radiance product.

## 4 EPS-SG 3MI LEVEL 1C PRODUCT DETAILED FORMAT

### 4.1 Product Summary Sheet

The table below provides a summary for the 3MI L1C radiance product. The filename in Table 2 is defined according to the conventions described in the [GPFS] and presented in Section 3.2 specifically for 3MI.

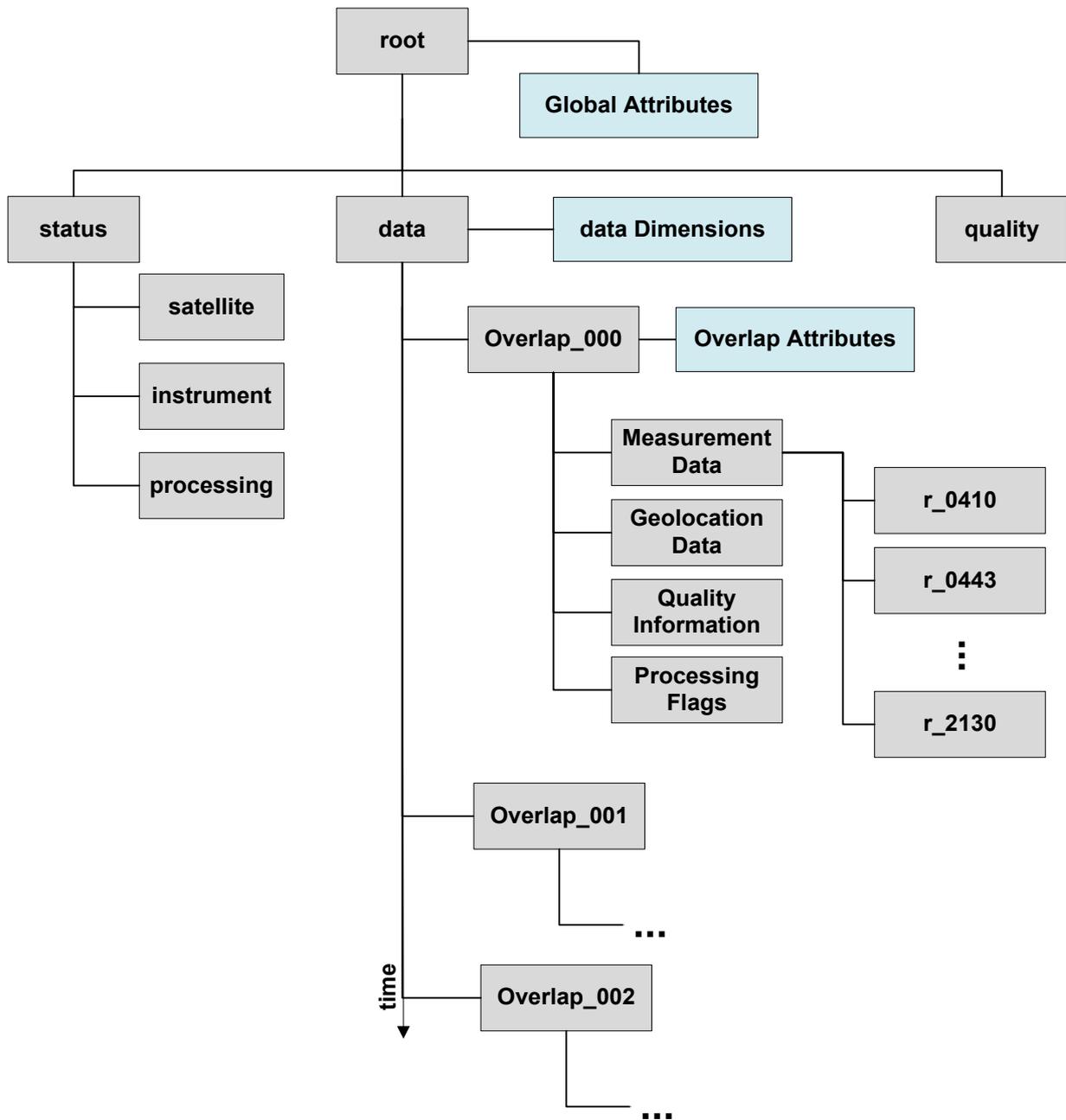
|                            |  |
|----------------------------|--|
| <b>Filename</b>            | <b>W_xx-eumetsat-darmstadt,SAT,SGA1-3MI-1C-RAD_C_EUMT_YYYYMMDDhhmmss_[G R L]_[O V D I E]_YYYYMMDDhhmmss_[T C O V N B R]____.nc</b> |
| <b>Product ID</b>          | <b>3MI-1C-RAD</b>  |
| <b>Product Description</b> | Stokes parameters on an equidistant Earth reference grid (first Stokes parameters for the non polarised channels)                  |
| <b>Format</b>              | netCDF-4   |
| <b>Size (MBytes/orbit)</b> | 6000 (see Appendix A)  |
| <b>Duration</b>            | To be defined in Phase C   |

**Table 2: 3MI-1C-RAD product summary sheet**

### 4.2 Overall Group Structure

The overall structure of 3MI L1C radiance product is in accordance with [GPFS], as described in Section 3.3. Within the 3MI L1C radiance product the */status* and */quality* groups contain information valid for the complete product. The */data* group holds a coverage-dependent number of *overlap\_xxx* subgroups, where each of these subgroups has the same structure:

- The *measurement\_data* subgroup (*/data/overlap\_xxx/measurement\_data*) hold one subgroup per 3MI spectral channel (*r\_0410*, *r\_0443* etc), that contains the actual measurements.
- The *geolocation\_data* subgroup (*/data/overlap\_xxx/geolcation\_data*) contains geolocation and auxiliary information.
- The *quality\_information* and *processing\_flags* subgroups (*/data/overlap\_xxx/quality\_information* and */data/overlap\_xxx/processing\_flags*) contain the quality information and processing flags for each overlap subgroup.



*Figure 1: Overview of the groups in the 3MI-1C-RAD product*

**4.3 Group Name: root**

**4.3.1 Attributes (global)**

Table 3 describes the global attributes for the 3MI L1C radiance product in accordance with ones defined in [GPFS].

| Attribute Name       | Type      | Meaning and/or value                             |
|----------------------|-----------|--|
| Conventions          | NC_STRING | e.g. "CF-1.6"                                    |
| metadata_conventions | NC_STRING | e.g. "Unidata Dataset Discovery v1.0"            |
| product_name         | NC_STRING | Product name formatted as set out in section 3.2 |
| title                | NC_STRING | 3MI L1C Gridded Radiances                        |

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| Attribute Name               | Type      | Meaning and/or value  |
|------------------------------|-----------|---|
| summary                      | NC_STRING | TBW   |
| doi                          | NC_STRING | Digital Object Identifier   |
| keywords                     | NC_STRING | TBW   |
| history                      | NC_STRING | ("original generated product"   "aggregated product"   "sub-setted product")  |
| [institution   organization] | NC_STRING | "EUMETSAT"  |
| spacecraft                   | NC_STRING | "SGA"[1-3]  |
| instrument                   | NC_STRING | Instrument or product identifier and flight model number<br>"3MI"   |
| product_level                | NC_STRING | "1C" = Calibrated and geolocated science data   |
| type                         | NC_STRING | RAD<br><br><i>Note: the name 'RAD' addresses mainly the system requirements, the product however provides the reflectance factor for the spectral bands</i>   |
| mission_type                 | NC_STRING | ("Global"   "Regional"   "Local")   |
| disposition_mode             | NC_STRING | Identification of the type of processing<br>("Test"   "Commissioning"   "Operational"   "Validation")<br><br>Test = Test data<br>Commissioning = Produced during commissioning<br>Operational = expected quality as per requirements based on fully performed validation<br>Validation = During validation of a new processor version during routine operations<br><br>The 'mode' of disposition is related to the suitability of the data for various kinds of uses, and hence the use that should be made of it and the destination to which it should (or should not) be sent. |
| sensing_start_utc            | NC_STRING | UTC time of start of sensing data formatted in CF date and time format with ms precision  |
| sensing_end_utc              | NC_STRING | UTC time of end of sensing data formatted in CF date and time format with ms precision  |
| environment                  | NC_STRING | ( "Operational"   "Validation"   "Integration & Verification"   "Development"   "Engineering" )   |
| references                   | NC_STRING | "www.eumetsat.int"<br><br><i>Note: It is intended that users of the product can access published, web-based references describing the data and the methods used to produce it at this address</i>   |
| orbit_start                  | NC_UINT   | Absolute orbit number at sensing_start_time_utc   |
| orbit_end                    | NC_UINT   | Absolute orbit number at sensing_end_time_utc   |
| xml_spec_file                | NC_STRING | Name of NcML file describing the current format   |

**Table 3: Global attributes for the 3MI-1C-RAD product**
**4.3.2 Dimensions (global)**

| Dimension Name | Description                         | Range or Value |
|----------------|-------------------------------------|----------------|
| overlaps       | Number of overlap groups in product | Variable       |

**Table 4: Global dimensions**
**4.3.3 Variables (global)**

No common global variables are currently envisaged.

**4.4 Group Name: /status**

This section describes the /status group for the 3MI L1C radiance product.

**4.4.1 Group Name: /status/satellite**
**4.4.1.1 /status/satellite: Attributes**

No common attributes are foreseen for the *Satellite* group.

**4.4.1.2 /status/satellite: Dimensions**

| Dimension Name  | Description  | Range or Value |
|-----------------|--|----------------|
| manoeuvre_items | Number of manoeuvres occurring between product start and end | variable       |

**Table 5: /status/satellite: Dimensions**
**4.4.1.3 /status/satellite: Variables**

| Variables Name  | Description                                      | Type      | Range or Value                        | Dimension |
|-----------------|--|-----------|---------------------------------------|-----------|
| epoch_time_utc  | Epoch time in UTC of the orbital elements        | NC_DOUBLE |                                       | 1         |
| long_name       | Variable long name                               | NC_STRING | see Description                       |           |
| units           | Physical units                                   | NC_STRING | seconds since 2020-01-01 00:00:00.000 |           |
| scale_factor    | Scale factor to be applied                       | NC_DOUBLE | 1.0                                   |           |
| add_offset      | Offset to be applied                             | NC_DOUBLE | 0.0                                   |           |
| valid_min       | Valid minimum value                              | NC_DOUBLE | -2500000000                           |           |
| valid_max       | Valid maximum value                              | NC_DOUBLE | 2500000000                            |           |
| missing_value   | missing value                                    | NC_DOUBLE | 9.96920996838 6869e+36                |           |
| semi_major_axis | Semi major axis of the orbit at epoch time [TOD] | NC_DOUBLE |                                       | 1         |
| long_name       | Variable long name                               | NC_STRING | see Description                       |           |
| units           | Physical units                                   | NC_STRING | m                                     |           |
| scale_factor    | Scale factor to be applied                       | NC_DOUBLE | 1.0                                   |           |
| add_offset      | Offset to be applied                             | NC_DOUBLE | 0.0                                   |           |
| valid_min       | Valid minimum value                              | NC_DOUBLE | 7000000.0                             |           |

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| Variables Name          | Description  | Type      | Range or Value            | Dimension |
|-------------------------|--|-----------|---------------------------|-----------|
| <i>valid_max</i>        | Valid maximum value                                  | NC_DOUBLE | 7500000.0                 |           |
| <i>missing_value</i>    | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>eccentricity</i>     | Eccentricity of the orbit at epoch time [TOD]        | NC_DOUBLE |                           | 1         |
| <i>long_name</i>        | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>            | Physical units                                       | NC_STRING | 1                         |           |
| <i>scale_factor</i>     | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>       | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>        | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| <i>valid_max</i>        | Valid maximum value                                  | NC_DOUBLE | 0.1                       |           |
| <i>missing_value</i>    | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>inclination</i>      | Inclination of the orbit at epoch time [TOD]         | NC_DOUBLE |                           | 1         |
| <i>long_name</i>        | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>            | Physical units                                       | NC_STRING | degrees                   |           |
| <i>scale_factor</i>     | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>       | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>        | Valid minimum value                                  | NC_DOUBLE | 95.0                      |           |
| <i>valid_max</i>        | Valid maximum value                                  | NC_DOUBLE | 100.0                     |           |
| <i>missing_value</i>    | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>perigee_argument</i> | Argument of perigee of the orbit at epoch time [TOD] | NC_DOUBLE |                           | 1         |
| <i>long_name</i>        | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>            | Physical units                                       | NC_STRING | degrees                   |           |
| <i>scale_factor</i>     | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>       | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>        | Valid minimum value                                  | NC_DOUBLE | 0.                        |           |
| <i>valid_max</i>        | Valid maximum value                                  | NC_DOUBLE | 360.                      |           |
| <i>missing_value</i>    | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>right_ascension</i>  | Right ascension of the orbit at epoch time [TOD]     | NC_DOUBLE |                           | 1         |
| <i>long_name</i>        | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>            | Physical units                                       | NC_STRING | degrees                   |           |
| <i>scale_factor</i>     | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>       | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>        | Valid minimum value                                  | NC_DOUBLE | 0.                        |           |
| <i>valid_max</i>        | Valid maximum value                                  | NC_DOUBLE | 360.                      |           |
| <i>missing_value</i>    | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>mean_anomaly</i>     | Mean anomaly of the orbit at epoch time [TOD]        | NC_DOUBLE |                           | 1         |
| <i>long_name</i>        | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>            | Physical units                                       | NC_STRING | degrees                   |           |
| <i>scale_factor</i>     | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>       | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |

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| Variables Name                       | Description   | Type      | Range or Value            | Dimension |
|--------------------------------------|---|-----------|---------------------------|-----------|
| <i>valid_min</i>                     | Valid minimum value   | NC_DOUBLE | 0.0                       |           |
| <i>valid_max</i>                     | Valid maximum value   | NC_DOUBLE | 360.0                     |           |
| <i>missing_value</i>                 | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>earth_sun_distan<br/>ce_ratio</i> | Ratio of current Earth-Sun<br>distance to Mean Earth-<br>Sun distance | NC_DOUBLE |                           | 1         |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                         | Physical units  | NC_STRING | 1                         |           |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>                     | Valid minimum value   | NC_DOUBLE | 0.9                       |           |
| <i>valid_max</i>                     | Valid maximum value   | NC_DOUBLE | 1.1                       |           |
| <i>missing_value</i>                 | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>subsat_latitude<br/>_start</i>    | Latitude of sub-satellite<br>point at start of the<br>product         | NC_DOUBLE |                           | 1         |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                         | Physical units  | NC_STRING | degrees_north             |           |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>                     | Valid minimum value   | NC_DOUBLE | -90.0                     |           |
| <i>valid_max</i>                     | Valid maximum value   | NC_DOUBLE | 90.0                      |           |
| <i>missing_value</i>                 | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>subsat_longitud<br/>e_start</i>   | Longitude of sub-satellite<br>point at start of the<br>product        | NC_DOUBLE |                           | 1         |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                         | Physical units  | NC_STRING | degrees_east              |           |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>                     | Valid minimum value   | NC_DOUBLE | 0.0                       |           |
| <i>valid_max</i>                     | Valid maximum value   | NC_DOUBLE | 360.0                     |           |
| <i>missing_value</i>                 | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>subsat_latitude<br/>_end</i>      | Latitude of sub-satellite<br>point at end of the product              | NC_DOUBLE |                           | 1         |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                         | Physical units  | NC_STRING | degrees_north             |           |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>                     | Valid minimum value   | NC_DOUBLE | -90.0                     |           |
| <i>valid_max</i>                     | Valid maximum value   | NC_DOUBLE | 90.0                      |           |
| <i>missing_value</i>                 | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>subsat_longitud<br/>e_end</i>     | Longitude of sub-satellite<br>point at end of the product             | NC_DOUBLE |                           | 1         |

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| Variables Name               | Description  | Type      | Range or Value            | Dimension |
|------------------------------|--|-----------|---------------------------|-----------|
| <i>long_name</i>             | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                 | Physical units                                       | NC_STRING | degrees_east              |           |
| <i>scale_factor</i>          | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>            | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>             | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| <i>valid_max</i>             | Valid maximum value                                  | NC_DOUBLE | 360.0                     |           |
| <i>missing_value</i>         | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>state_vector_time_utc</i> | Time of the state vector and attitude items          | NC_DOUBLE |                           | 1         |
| <i>long_name</i>             | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                 | Physical units                                       | NC_STRING | s                         |           |
| <i>scale_factor</i>          | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>            | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>             | Valid minimum value                                  | NC_DOUBLE | -2500000000               |           |
| <i>valid_max</i>             | Valid maximum value                                  | NC_DOUBLE | 2500000000                |           |
| <i>missing_value</i>         | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>x_position</i>            | X position of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| <i>long_name</i>             | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                 | Physical units                                       | NC_STRING | m                         |           |
| <i>scale_factor</i>          | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>            | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>             | Valid minimum value                                  | NC_DOUBLE | 0                         |           |
| <i>valid_max</i>             | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| <i>missing_value</i>         | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>y_position</i>            | Y position of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| <i>long_name</i>             | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                 | Physical units                                       | NC_STRING | m                         |           |
| <i>scale_factor</i>          | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>            | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>             | Valid minimum value                                  | NC_DOUBLE | 0                         |           |
| <i>valid_max</i>             | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| <i>missing_value</i>         | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| <i>z_position</i>            | Z position of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| <i>long_name</i>             | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| <i>units</i>                 | Physical units                                       | NC_STRING | m                         |           |
| <i>scale_factor</i>          | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| <i>add_offset</i>            | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| <i>valid_min</i>             | Valid minimum value                                  | NC_DOUBLE | 0                         |           |
| <i>valid_max</i>             | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| <i>missing_value</i>         | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |

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| Variables Name | Description  | Type      | Range or Value            | Dimension |
|----------------|--|-----------|---------------------------|-----------|
| x_velocity     | X velocity of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| long_name      | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| units          | Physical units                                       | NC_STRING | m/s                       |           |
| scale_factor   | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| add_offset     | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| valid_min      | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| valid_max      | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| missing_value  | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| y_velocity     | Y velocity of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| long_name      | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| units          | Physical units                                       | NC_STRING | m/s                       |           |
| scale_factor   | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| add_offset     | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| valid_min      | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| valid_max      | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| missing_value  | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| z_velocity     | Z velocity of the orbital state vector [EARTH+FIXED] | NC_DOUBLE |                           | 1         |
| long_name      | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| units          | Physical units                                       | NC_STRING | m/s                       |           |
| scale_factor   | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| add_offset     | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| valid_min      | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| valid_max      | Valid maximum value                                  | NC_DOUBLE | TBD                       |           |
| missing_value  | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| yaw_error      | Yaw attitude error                                   | NC_DOUBLE |                           | 1         |
| long_name      | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| units          | Physical units                                       | NC_STRING | degrees                   |           |
| scale_factor   | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| add_offset     | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| valid_min      | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| valid_max      | Valid maximum value                                  | NC_DOUBLE | 10.0                      |           |
| missing_value  | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| roll_error     | Roll attitude error                                  | NC_DOUBLE |                           | 1         |
| long_name      | Variable long name                                   | NC_STRING | <i>see Description</i>    |           |
| units          | Physical units                                       | NC_STRING | degrees                   |           |
| scale_factor   | Scale factor to be applied                           | NC_DOUBLE | 1.0                       |           |
| add_offset     | Offset to be applied                                 | NC_DOUBLE | 0.0                       |           |
| valid_min      | Valid minimum value                                  | NC_DOUBLE | 0.0                       |           |
| valid_max      | Valid maximum value                                  | NC_DOUBLE | 10.0                      |           |
| missing_value  | missing value  | NC_DOUBLE | 9.96920996838<br>6869e+36 |           |
| pitch_error    | Pitch attitude error                                 | NC_DOUBLE |                           | 1         |

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| Variables Name       | Description   | Type      | Range or Value                              | Dimension       |
|----------------------|---|-----------|---|-----------------|
| <i>long_name</i>     | Variable long name  | NC_STRING | <i>see Description</i>                      |                 |
| <i>units</i>         | Physical units  | NC_STRING | degrees                                     |                 |
| <i>scale_factor</i>  | Scale factor to be applied  | NC_DOUBLE | 1.0   |                 |
| <i>add_offset</i>    | Offset to be applied  | NC_DOUBLE | 0.0   |                 |
| <i>valid_min</i>     | Valid minimum value   | NC_DOUBLE | 0.0   |                 |
| <i>valid_max</i>     | Valid maximum value   | NC_DOUBLE | 10.0  |                 |
| <i>missing_value</i> | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36                   |                 |
| leap_second_time_utc | UTC time of occurrence of a leap second in this product (if leap second occurred in the product time window); it represents the time after the leap second occurrence (i.e. midnight of day after the leap second; no leap second results in 0) | NC_DOUBLE |   | 1               |
| <i>long_name</i>     | Variable long name  | NC_STRING | <i>see Description</i>                      |                 |
| <i>units</i>         | Physical units  | NC_STRING | seconds since<br>2020-01-01<br>00:00:00.000 |                 |
| <i>scale_factor</i>  | Scale factor to be applied  | NC_DOUBLE | 1.0   |                 |
| <i>add_offset</i>    | Offset to be applied  | NC_DOUBLE | 0.0   |                 |
| <i>valid_min</i>     | Valid minimum value   | NC_DOUBLE | -2500000000                                 |                 |
| <i>valid_max</i>     | Valid maximum value   | NC_DOUBLE | 2500000000                                  |                 |
| <i>missing_value</i> | missing value   | NC_DOUBLE | 9.96920996838<br>6869e+36                   |                 |
| leap_second_value    | Value of leap second in product (1, 0, or -1)<br>1 = increment<br>-1 = decrement  | NC_SHORT  |   | 1               |
| <i>long_name</i>     | Variable long name  | NC_STRING | <i>see Description</i>                      |                 |
| <i>units</i>         | Physical units  | NC_STRING | s   |                 |
| <i>scale_factor</i>  | Scale factor to be applied  | NC_SHORT  | 1.0   |                 |
| <i>add_offset</i>    | Offset to be applied  | NC_SHORT  | 0.0   |                 |
| <i>valid_min</i>     | Valid minimum value   | NC_SHORT  | -1.0  |                 |
| <i>valid_max</i>     | Valid maximum value   | NC_SHORT  | 1.0   |                 |
| <i>missing_value</i> | missing value   | NC_SHORT  | -32767                                      |                 |
| manoeuvre_occurrence | Occurrence of manoeuvres between start and end times of the product (0, 1 or 2)<br>0 = no manoeuvre occurred,<br>1 = in-plane manoeuvre occurred<br>2 = out-of-plane manoeuvre occurred   | NC_BYTE   |   | manoeuvre_items |

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| Variables Name                  | Description                    | Type      | Range or Value                        | Dimension       |
|---------------------------------|--------------------------------|-----------|---------------------------------------|-----------------|
| <i>long_name</i>                | Variable long name             | NC_STRING | <i>see Description</i>                |                 |
| <i>units</i>                    | Physical units                 | NC_STRING | 1                                     |                 |
| <i>valid_min</i>                | Valid minimum value            | NC_BYTE   | 0b                                    |                 |
| <i>valid_max</i>                | Valid maximum value            | NC_BYTE   | 2b                                    |                 |
| <i>missing_value</i>            | missing value                  | NC_BYTE   | -128b                                 |                 |
| <i>manoeuvre_start_time_utc</i> | UTC time of start of manoeuvre | NC_DOUBLE |                                       | manoeuvre_items |
| <i>long_name</i>                | Variable long name             | NC_STRING | <i>see Description</i>                |                 |
| <i>units</i>                    | Physical units                 | NC_STRING | seconds since 2020-01-01 00:00:00.000 |                 |
| <i>scale_factor</i>             | Scale factor to be applied     | NC_DOUBLE | 1.0                                   |                 |
| <i>add_offset</i>               | Offset to be applied           | NC_DOUBLE | 0.0                                   |                 |
| <i>valid_min</i>                | Valid minimum value            | NC_DOUBLE | -2500000000                           |                 |
| <i>valid_max</i>                | Valid maximum value            | NC_DOUBLE | 2500000000                            |                 |
| <i>missing_value</i>            | missing value                  | NC_DOUBLE | 9.96920996838 6869e+36                |                 |
| <i>manoeuvre_end_time_utc</i>   | UTC time of end of manoeuvre   | NC_DOUBLE |                                       | manoeuvre_items |
| <i>long_name</i>                | Variable long name             | NC_STRING | <i>see Description</i>                |                 |
| <i>units</i>                    | Physical units                 | NC_STRING | seconds since 2020-01-01 00:00:00.000 |                 |
| <i>scale_factor</i>             | Scale factor to be applied     | NC_DOUBLE | 1.0                                   |                 |
| <i>add_offset</i>               | Offset to be applied           | NC_DOUBLE | 0.0                                   |                 |
| <i>valid_min</i>                | Valid minimum value            | NC_DOUBLE | -2500000000                           |                 |
| <i>valid_max</i>                | Valid maximum value            | NC_DOUBLE | 2500000000                            |                 |
| <i>missing_value</i>            | missing value                  | NC_DOUBLE | 9.96920996838 6869e+36                |                 |

**Table 6: /status/satellite: Variables**
**4.4.2 Group Name: /status/instrument**
**4.4.2.1 /status/instrument: Attributes**

No common attributes are foreseen for the *Instrument Status* group.

**4.4.2.2 /status/instrument/: Dimensions**

| Dimension Name | Description  | Range or Value |
|----------------|--|----------------|
| mode_items     | Number of modes the instrument assumed during product duration | TBD            |

**Table 7: /status/instrument: Dimensions**
**4.4.2.3 /status/instrument: Variables**

| Variables Name      | Description                         | Type      | Range or Value         | Dimension  |
|---------------------|-------------------------------------|-----------|------------------------|------------|
| mode_start_time_utc | Start time of the mode              | NC_DOUBLE |                        | mode_items |
| long_name           | Variable long name                  | NC_STRING | <i>see Description</i> |            |
| units               | Physical units                      | NC_STRING | s                      |            |
| scale_factor        | Scale factor to be applied          | NC_DOUBLE | 1.0                    |            |
| add_offset          | Offset to be applied                | NC_DOUBLE | 0.0                    |            |
| valid_min           | Valid minimum value                 | NC_DOUBLE | -2500000000            |            |
| valid_max           | Valid maximum value                 | NC_DOUBLE | 2500000000             |            |
| missing_value       | missing value                       | NC_DOUBLE | 9.969209968386869e+36  |            |
| mode_end_time_utc   | End time of the mode                | NC_DOUBLE |                        | mode_items |
| long_name           | Variable long name                  | NC_STRING | <i>see Description</i> |            |
| units               | Physical units                      | NC_STRING | s                      |            |
| scale_factor        | Scale factor to be applied          | NC_DOUBLE | 1.0                    |            |
| add_offset          | Offset to be applied                | NC_DOUBLE | 0.0                    |            |
| valid_min           | Valid minimum value                 | NC_DOUBLE | -2500000000            |            |
| valid_max           | Valid maximum value                 | NC_DOUBLE | 2500000000             |            |
| missing_value       | missing value                       | NC_DOUBLE | 9.969209968386869e+36  |            |
| instrument_mode     | Name of the instrument mode assumed | NC_STRING |                        | mode_items |
| long_name           | Variable long name                  | NC_STRING | <i>see Description</i> |            |
| units               | Physical units                      | NC_STRING |                        |            |
| missing_value       | missing value                       | NC_STRING |                        |            |

**Table 8: /status/instrument: Variables**
**4.4.3 Group Name: /status/instrument/VII**
**4.4.3.1 /status/instrument/VII: Attributes**

No common attributes are foreseen for the *Instrument Status* group.

**4.4.3.2 /status/instrument/VII: Dimensions**

| Dimension Name | Description   | Range or Value |
|----------------|---|----------------|
| mode_items     | Number of modes of the VII instrument assumed during product duration | TBD            |

**Table 9: /status/instrument/VII: Dimensions**
**4.4.3.3 /status/instrument/VII: Variables**

| Variables Name      | Description                         | Type      | Range or Value        | Dimension  |
|---------------------|-------------------------------------|-----------|-----------------------|------------|
| mode_start_time_utc | Start time of the mode              | NC_DOUBLE |                       | mode_items |
| long_name           | Variable long name                  | NC_STRING | see Description       |            |
| units               | Physical units                      | NC_STRING | s                     |            |
| scale_factor        | Scale factor to be applied          | NC_DOUBLE | 1.0                   |            |
| add_offset          | Offset to be applied                | NC_DOUBLE | 0.0                   |            |
| valid_min           | Valid minimum value                 | NC_DOUBLE | -2500000000           |            |
| valid_max           | Valid maximum value                 | NC_DOUBLE | 2500000000            |            |
| missing_value       | missing value                       | NC_DOUBLE | 9.969209968386869e+36 |            |
| mode_end_time_utc   | End time of the mode                | NC_DOUBLE |                       | mode_items |
| long_name           | Variable long name                  | NC_STRING | see Description       |            |
| units               | Physical units                      | NC_STRING | s                     |            |
| scale_factor        | Scale factor to be applied          | NC_DOUBLE | 1.0                   |            |
| add_offset          | Offset to be applied                | NC_DOUBLE | 0.0                   |            |
| valid_min           | Valid minimum value                 | NC_DOUBLE | -2500000000           |            |
| valid_max           | Valid maximum value                 | NC_DOUBLE | 2500000000            |            |
| missing_value       | missing value                       | NC_DOUBLE | 9.969209968386869e+36 |            |
| instrument_mode     | Name of the instrument mode assumed | NC_STRING |                       | mode_items |
| long_name           | Variable long name                  | NC_STRING | see Description       |            |
| units               | Physical units                      | NC_STRING |                       |            |
| missing_value       | missing value                       | NC_STRING |                       |            |

**Table 10: /status/instrument/VII: Variables**
**4.4.4 Group Name: /status/processing**
**4.4.4.1 /status/processing: Attributes**

| Attribute Name             | Description   | Type      |
|----------------------------|---|-----------|
| processor_name             | 3MI_L1C   | NC_STRING |
| processor_version          | Version number of the processor   | NC_STRING |
| processing_mode            | ( NRT   Reprocessing )<br>Processing mode in which the product was generated    | NC_STRING |
| pgs_reference_and_version  | Reference and version of the PGS  | NC_STRING |
| pfs_reference_and_version  | Reference and version of the PFS  | NC_STRING |
| atbd_reference_and_version | Reference and version of the ATBD   | NC_STRING |
| baseline                   | Climate data record collection version in reprocessed data (optional attribute) | NC_STRING |

| Attribute Name | Description   | Type      |
|----------------|---|-----------|
| source         | A scalar string as particularised in the relevant product format specification, containing an array of bracketed strings of the form specified as follows:<br>(AUXILIARY_DATA_NAME)*<br>(INPUT_PRODUCT_NAME)* where the asterisks indicate zero or more instances | NC_STRING |

**Table 11: /status/processing: Attributes**

#### 4.4.4.2 /status/processing: Dimensions

No dimensions are foreseen for the *Processing Status* group.

#### 4.4.4.3 /status/processing: Variables

| Variables Name    | Description                        | Type      | Range or Value                    | Dimension |
|-------------------|------------------------------------|-----------|-----------------------------------|-----------|
| creation_time_utc | UTC time of the product processing | NC_DOUBLE |                                   | 1         |
| long_name         | Variable long name                 | NC_STRING | <i>see Description</i>            |           |
| units             | Physical units                     | NC_STRING | seconds since 2020-01-01 00:00:00 |           |
| valid_min         | Valid minimum value                | NC_DOUBLE | -2500000000.                      |           |
| valid_max         | Valid maximum value                | NC_DOUBLE | 2500000000.                       |           |
| missing_value     | missing value                      | NC_DOUBLE | 9.969209968386869e+36             |           |

**Table 12: /status/processing: Variables**

#### 4.5 Group Name: /data

The *data* group contains a number of *overlap\_xxx* groups, with the actual number depending on the temporal coverage of the product. In addition, a number of variables common to all following subgroups are contained.

##### 4.5.1 /data: Dimensions

| Dimension Name         | Description                       | Range or Value |
|------------------------|-----------------------------------|----------------|
| spectral_channels      | Total number of spectral channels | 12             |
| spectral_channels_VNIR | Number of VNIR spectral channels  | 9              |
| spectral_channels_SWIR | Number of SWIR spectral channels  | 3              |

**Table 13: /data: Dimensions**

##### 4.5.2 /data: Variables

| Variables Name          | Description  | Type      | Range or Value                     | Dimension         |
|-------------------------|--|-----------|------------------------------------|-------------------|
| grid_sampling_parameter | Geo-reference fixed grid sampling parameter (number of samples per degree of latitude)                 | NC_SHORT  |                                    | 1                 |
| long_name               | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| units                   | Physical units   | NC_STRING | pixel/deg                          |                   |
| scale_factor            | Scale factor to be applied   | NC_DOUBLE | 1.0                                |                   |
| add_offset              | Offset to be applied   | NC_DOUBLE | 0.0                                |                   |
| valid_min               | Valid minimum value  | NC_SHORT  | 0                                  |                   |
| valid_max               | Valid maximum value  | NC_SHORT  | 100                                |                   |
| missing_value           | missing value  | NC_SHORT  | -32768                             |                   |
| centre_wavelengths      | Centre wavelength for 3MI channels at 410, 443, 490, 555, 670, 763, 765, 865, 910, 1370, 1650, 2130 nm | NC_FLOAT  |                                    | spectral_channels |
| long_name               | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| units                   | Physical units   | NC_STRING | nm                                 |                   |
| scale_factor            | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| add_offset              | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| valid_min               | Valid minimum value  | NC_FLOAT  | 400.                               |                   |
| valid_max               | Valid maximum value  | NC_FLOAT  | 2500.                              |                   |
| missing_value           | missing value  | NC_FLOAT  | 9.969209968386869e+36              |                   |
| solar_irradiance        | solar irradiance for 3MI channels at 410, 443, 490, 555, 670, 763, 765, 865, 910, 1370, 1650, 2130 nm  | NC_DOUBLE |                                    | spectral_channels |
| long_name               | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| units                   | Physical units   | NC_STRING | W m <sup>-2</sup> nm <sup>-1</sup> |                   |
| scale_factor            | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| add_offset              | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| valid_min               | Valid minimum value  | NC_DOUBLE | 0.                                 |                   |

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| Variables Name                | Description  | Type      | Range or Value                     | Dimension         |
|-------------------------------|--|-----------|------------------------------------|-------------------|
| <i>valid_max</i>              | Valid maximum value  | NC_DOUBLE | TBD                                |                   |
| <i>missing_value</i>          | missing value  | NC_DOUBLE | 9.969209968386869e+36              |                   |
| <i>solar_irradiance_error</i> | Random contribution error of solar irradiance for 3MI channels at 410, 443, 490, 555, 670, 763, 765, 865, 910, 1370, 1650, 2130 nm | NC_DOUBLE |                                    | spectral_channels |
| <i>long_name</i>              | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| <i>units</i>                  | Physical units   | NC_STRING | W m <sup>-2</sup> nm <sup>-1</sup> |                   |
| <i>scale_factor</i>           | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| <i>add_offset</i>             | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| <i>valid_min</i>              | Valid minimum value  | NC_DOUBLE | 0.                                 |                   |
| <i>valid_max</i>              | Valid maximum value  | NC_DOUBLE | TBD                                |                   |
| <i>missing_value</i>          | missing value  | NC_DOUBLE | 9.969209968386869e+36              |                   |
| <i>channel_time_offset</i>    | Offset of spectral acquisition time (within a wheel turn) with respect to the central acquisition time                             | NC_FLOAT  |                                    | spectral_channels |
| <i>long_name</i>              | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| <i>units</i>                  | Physical units   | NC_STRING | s                                  |                   |
| <i>scale_factor</i>           | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| <i>add_offset</i>             | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| <i>valid_min</i>              | Valid minimum value  | NC_FLOAT  | -10.                               |                   |
| <i>valid_max</i>              | Valid maximum value  | NC_FLOAT  | 10.                                |                   |
| <i>missing_value</i>          | missing value  | NC_FLOAT  | 9.969209968386869e+36              |                   |
| <i>reference_longitude</i>    | Reference longitude of sinusoidal projection (needed to convert J,l to lon,lat)  | NC_FLOAT  |                                    | 1                 |
| <i>long_name</i>              | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| <i>units</i>                  | Physical units   | NC_STRING | deg                                |                   |
| <i>scale_factor</i>           | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| <i>add_offset</i>             | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| <i>valid_min</i>              | Valid minimum value  | NC_FLOAT  | -180.                              |                   |
| <i>valid_max</i>              | Valid maximum value  | NC_FLOAT  | 180.                               |                   |
| <i>missing_value</i>          | missing value  | NC_FLOAT  | 9.969209968386869e+36              |                   |
| <i>maximum_grid_row_index</i> | maximum number of rows of co-registration grid.  | NC_SHORT  |                                    | 1                 |
| <i>long_name</i>              | Variable long name   | NC_STRING | <i>see Description</i>             |                   |
| <i>units</i>                  | Physical units   | NC_STRING | -                                  |                   |
| <i>scale_factor</i>           | Scale factor to be applied   | NC_DOUBLE | 1.                                 |                   |
| <i>add_offset</i>             | Offset to be applied   | NC_DOUBLE | 0.                                 |                   |
| <i>valid_min</i>              | Valid minimum value  | NC_SHORT  | 0                                  |                   |
| <i>valid_max</i>              | Valid maximum value  | NC_SHORT  | 32767                              |                   |

| Variables Name                   | Description  | Type      | Range or Value         | Dimension |
|----------------------------------|--|-----------|------------------------|-----------|
| <i>missing_value</i>             | missing value                                      | NC_SHORT  | -32768                 |           |
| <i>maximum_grid_column_index</i> | maximum number of columns of co-registration grid. | NC_SHORT  |                        | 1         |
| <i>long_name</i>                 | Variable long name                                 | NC_STRING | <i>see Description</i> |           |
| <i>units</i>                     | Physical units                                     | NC_STRING | -                      |           |
| <i>scale_factor</i>              | Scale factor to be applied                         | NC_DOUBLE | 1.                     |           |
| <i>add_offset</i>                | Offset to be applied                               | NC_DOUBLE | 0.                     |           |
| <i>valid_min</i>                 | Valid minimum value                                | NC_SHORT  | 0                      |           |
| <i>valid_max</i>                 | Valid maximum value                                | NC_SHORT  | 32767                  |           |
| <i>missing_value</i>             | missing value                                      | NC_SHORT  | -32768                 |           |

**Table 14: /data: Variables**

#### 4.5.3 Group name: /data/overlap\_xxx

The *overlap\_xxx* (with *xxx*=["000", "001", ...]) groups contain 3 subgroups: *measurement\_data*, *quality\_information* and *processing\_flags*.

##### 4.5.3.1 /data/overlap\_xxx: Attributes

| Attribute Name                  | Description  | Type      | Unit | Range or Value |
|---------------------------------|--|-----------|------|----------------|
| <i>overlap_start_time_utc</i>   | UTC time of start of overlap, formatted in CF date and time format | NC_STRING |      |                |
| <i>overlap_average_time_utc</i> | UTC average time of overlap, formatted in CF date and time format  | NC_STRING |      |                |
| <i>overlap_stop_time_utc</i>    | UTC time of end of overlap, formatted in CF date and time format   | NC_STRING |      |                |
| <i>l1b_start_time_utc</i>       | UTC average time of first L1B view processed for the overlap       | NC_STRING |      |                |
| <i>l1b_stop_time_utc</i>        | UTC average time of last L1B view processed for the overlap        | NC_STRING |      |                |

**Table 15: /data/overlap\_xxx: Attributes**

##### 4.5.3.2 /data/overlap\_xxx: Dimensions

| Dimension Name                  | Description                       | Range or Value             |
|---------------------------------|-----------------------------------|----------------------------|
| <i>geo_reference_grid_cells</i> | Number of grid cells in overlap   | Variable                   |
| <i>viewing_directions_VNIR</i>  | Number of VNIR viewing directions | Configurable (default: 14) |
| <i>viewing_directions_SWIR</i>  | Number of SWIR viewing directions | Configurable (default: 12) |

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| Dimension Name            | Description  | Range or Value  |
|---------------------------|--|---|
| unique_viewing_directions | Number of unique viewing directions  | Calculated as a function of viewing_directions_VNIR and viewing_directions_SWIR (e.g. 21, if viewing_directions_VNIR=14 and viewing_directions_SWIR=12) |
| coloc_directions          | Number of directions for the variables to be co-located to the 3MI instrument grid           | Same value as viewing_directions_VNIR (e.g. 14)   |
| grid_coloc_directions     | Number of directions for the variables to be co-located straight to the co-registration grid | Default: 1 (can be set to the same value as 'coloc_directions' for test porpouse)   |
| vii_radiance_channels     | Number of VII radiance channels for inhomogeneity calculation                                | 3   |
| SWIR_overlaps             | Number of SWIR overlaps used to cover overlap area   | 3 or 4, depending on viewing_directions_VNIR and viewing_directions_SWIR  |
| angles_fit_coefficients   | Number of fit coefficients for azimuth and zenith satellite and solar angles                 | 7   |

**4.5.3.3 Group Name: /data/overlap\_xxx/measurement\_data**

The *measurement\_data* group contains the r\_xxxx subgroups (with xxxx=[0410|0443|...]), i.e. there is on group per 3MI spectral channel.

**4.5.3.3.1 Group Name: /data/overlap\_xxx/measurement\_data/r\_xxxx**

The 12 r\_xxxx groups (9 VNIR + 3 SWIR groups) contain the actual measurements of the particular overlap as radiances or reflectances (TBC) and the associated error estimates.

**4.5.3.3.1.1 /data/overlap\_xxx/measurement\_data/r\_xxxx: Variables**

| Variables Name | Description                                | Type      | Range or Value  | Dimension  |
|----------------|--|-----------|-----------------|--|
| reflectance_l  | Reflectance factor re-sampled on grid cell | NC_SHORT  |                 | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| long_name      | Variable long name                         | NC_STRING | see Description |  |
| units          | Physical units                             | NC_STRING | 1               |  |
| scale_factor   | Scale factor to be applied                 | NC_DOUBLE | 1e-4            |  |
| add_offset     | Offset to be applied                       | NC_DOUBLE | 0.0             |  |
| valid_min      | Valid minimum value                        | NC_SHORT  | -20000          |  |
| valid_max      | Valid maximum value                        | NC_SHORT  | 20000           |  |
| missing_value  | missing value                              | NC_SHORT  | -32768          |  |

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| Variables Name  | Description  | Type      | Range or Value  | Dimension  |
|---|--|-----------|-----------------|--|
| reflectance_I_error   | Random contribution error of reflectance factor I, re-sampled on grid cell, encoded as 10 times the base-10 logarithmic value of the ratio between the measurement value and the error | NC_UBYTE  |                 | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| long_name   | Variable long name   | NC_STRING | see Description |  |
| units   | Physical units   | NC_STRING | 1               |  |
| scale_factor  | Scale factor to be applied   | NC_DOUBLE | 0.1             |  |
| add_offset  | Offset to be applied   | NC_DOUBLE | 0.0             |  |
| valid_min   | Valid minimum value  | NC_UBYTE  | 0               |  |
| valid_max   | Valid maximum value  | NC_UBYTE  | 254             |  |
| missing_value   | missing value  | NC_UBYTE  | 255             |  |
| <i>Below: Additional variables common to all channels except for r_0763, r_0765 and r_910</i> |  |           |                 |  |
| reflectance_Q   | Reflectance factor for 90 degrees polarized light, re-sampled on grid cell   | NC_SHORT  |                 | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| long_name   | Variable long name   | NC_STRING | see Description |  |
| units   | Physical units   | NC_STRING | 1               |  |
| scale_factor  | Scale factor to be applied   | NC_DOUBLE | 1e-4            |  |
| add_offset  | Offset to be applied   | NC_DOUBLE | 0.0             |  |
| valid_min   | Valid minimum value  | NC_SHORT  | -20000          |  |
| valid_max   | Valid maximum value  | NC_SHORT  | 20000           |  |
| missing_value   | missing value  | NC_SHORT  | -32768          |  |
| reflectance_U   | Reflectance factor for 45 degrees polarized light, re-sampled on grid cell   | NC_SHORT  |                 | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| long_name   | Variable long name   | NC_STRING | see Description |  |
| units   | Physical units   | NC_STRING | 1               |  |
| scale_factor  | Scale factor to be applied   | NC_DOUBLE | 1e-4            |  |
| add_offset  | Offset to be applied   | NC_DOUBLE | 0.0             |  |
| valid_min   | Valid minimum value  | NC_SHORT  | -20000          |  |
| valid_max   | Valid maximum value  | NC_SHORT  | 20000           |  |
| missing_value   | missing value  | NC_SHORT  | -32768          |  |
| reflectance_Q_error   | Random contribution error of reflectance factor Q, re-sampled on grid cell, encoded as 10 times the base-10 logarithmic value of the ratio between the measurement value and the error | NC_UBYTE  |                 | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| long_name   | Variable long name   | NC_STRING | see Description |  |
| units   | Physical units   | NC_STRING | 1               |  |
| scale_factor  | Scale factor to be applied   | NC_DOUBLE | 0.1             |  |

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| Variables Name             | Description  | Type      | Range or Value         | Dimension  |
|----------------------------|--|-----------|------------------------|--|
| <i>add_offset</i>          | Offset to be applied   | NC_DOUBLE | 0.0                    |  |
| <i>valid_min</i>           | Valid minimum value  | NC_UBYTE  | 0                      |  |
| <i>valid_max</i>           | Valid maximum value  | NC_UBYTE  | 254                    |  |
| <i>missing_value</i>       | missing value  | NC_UBYTE  | 255                    |  |
| <i>reflectance_U_error</i> | Random contribution error of reflectance factor U, re-sampled on grid cell, encoded as 10 times the base-10 logarithmic value of the ratio between the measurement value and the error | NC_UBYTE  |                        | geo_reference_grid_cells<br>viewing_directions_[VNIR SWIR] |
| <i>long_name</i>           | Variable long name   | NC_STRING | <i>see Description</i> |  |
| <i>units</i>               | Physical units   | NC_STRING | 1                      |  |
| <i>scale_factor</i>        | Scale factor to be applied   | NC_DOUBLE | 0.1                    |  |
| <i>add_offset</i>          | Offset to be applied   | NC_DOUBLE | 0.0                    |  |
| <i>valid_min</i>           | Valid minimum value  | NC_UBYTE  | 0                      |  |
| <i>valid_max</i>           | Valid maximum value  | NC_UBYTE  | 254                    |  |
| <i>missing_value</i>       | missing value  | NC_UBYTE  | 255                    |  |

**Table 16: /data/overlap\_xxx/Measurement\_Data/r\_xxxx: Variables**

**4.5.3.4 Group Name: /data/overlap\_xxx/geolocation\_data**

The *geolocation\_data* group contains the geolocation information common to all spectral channels. In addition, some geophysical auxiliary information is provided.

**4.5.3.4.1 /data/overlap\_xxx/geolocation\_data: Dimensions**

| Dimension Name      | Description   | Range or Value |
|---------------------|---|----------------|
| <i>bounding_box</i> | Minimum and maximum of either latitude or longitude | 2              |

**Table 17:/data/overlap\_xxx/geolocation\_data: Dimensions**

**4.5.3.4.2 /data/overlap\_xxx/geolocation\_data: Variables**

| Variables Name       | Description                            | Type      | Range or Value         | Dimension                |
|----------------------|--|-----------|------------------------|--------------------------|
| <i>longitude</i>     | longitude of co-registration grid cell | NC_FLOAT  |                        | geo_reference_grid_cells |
| <i>long_name</i>     | Variable long name                     | NC_STRING | <i>see Description</i> |                          |
| <i>units</i>         | Physical units                         | NC_STRING | deg                    |                          |
| <i>scale_factor</i>  | Scale factor to be applied             | NC_DOUBLE | 1.0                    |                          |
| <i>add_offset</i>    | Offset to be applied                   | NC_DOUBLE | 0.0                    |                          |
| <i>valid_min</i>     | Valid minimum value                    | NC_FLOAT  | -180.0                 |                          |
| <i>valid_max</i>     | Valid maximum value                    | NC_FLOAT  | 180.0                  |                          |
| <i>missing_value</i> | missing value                          | NC_FLOAT  | 9.969209968386869e+36  |                          |
| <i>latitude</i>      | latitude of co-registration grid cell  | NC_FLOAT  |                        | geo_reference_grid_cells |
| <i>long_name</i>     | Variable long name                     | NC_STRING | <i>see Description</i> |                          |
| <i>units</i>         | Physical units                         | NC_STRING | deg                    |                          |

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| Variables Name                     | Description  | Type      | Range or Value            | Dimension   |
|------------------------------------|--|-----------|---------------------------|---|
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | -90.0                     |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | 90.0                      |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>bounding_box_latitude</i>       | Minimum and maximum latitude of overlap bounding box   | NC_FLOAT  |                           | bounding_box  |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | deg                       |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | -90.0                     |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | 90.0                      |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  |                           |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>bounding_box_longitude</i>      | Minimum and maximum longitude of overlap bounding box  | NC_FLOAT  |                           | bounding_box  |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | deg                       |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | -180.0                    |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | 180.0                     |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>surface_height</i>              | Average surface height of pixel J,I colocated from ACE2 DEM directly on the co-registration grid | NC_SHORT  |                           | geo_reference_<br>grid_cells<br>grid_coloc_dire<br>ctions |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | deg                       |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_SHORT  | -10000                    |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_SHORT  | 10000                     |   |
| <i>missing_value</i>               | missing value  | NC_SHORT  | -32768                    |   |
| <i>norm_satellite_orbit_radius</i> | Normalized satellite orbit radius (Rh)   | NC_DOUBLE |                           | 1   |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                   |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_DOUBLE | 0.0                       |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_DOUBLE | 2.0                       |   |
| <i>missing_value</i>               | missing value  | NC_DOUBLE | 9.969209968386869<br>e+36 |   |

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| Variables Name               | Description  | Type      | Range or Value        | Dimension                 |
|------------------------------|--|-----------|-----------------------|---------------------------|
| angular_velocity_satellite   | Angular velocity of satellite corrected for Earth velocity (omega)   | NC_DOUBLE |                       | 1                         |
| long_name                    | Variable long name   | NC_STRING | see Description       |                           |
| units                        | Physical units   | NC_STRING | rad/sec               |                           |
| scale_factor                 | Scale factor to be applied   | NC_DOUBLE | 1.0                   |                           |
| add_offset                   | Offset to be applied   | NC_DOUBLE | 0.0                   |                           |
| valid_min                    | Valid minimum value  | NC_DOUBLE | 0.0                   |                           |
| valid_max                    | Valid maximum value  | NC_DOUBLE | 5.0e-5                |                           |
| missing_value                | missing value  | NC_DOUBLE | 9.969209968386869e+36 |                           |
| overlap_average_time         | average time stamp of overlap (seconds since 2020-01-01 00:00:00.000). The reference time is set to yyyy-mm-ddT00:00:00.000 UTC, where yyyy-mm-dd is the day on which the measurements of a particular data granule start. | NC_INT    |                       | 1                         |
| long_name                    | Variable long name   | NC_STRING | see Description       |                           |
| units                        | Physical units   | NC_STRING | s                     |                           |
| scale_factor                 | Scale factor to be applied   | NC_DOUBLE | 1.0                   |                           |
| add_offset                   | Offset to be applied   | NC_DOUBLE | 0.0                   |                           |
| precision                    | Precision  | NC_STRING | 1s                    |                           |
| valid_min                    | Valid minimum value  | NC_INT    | -2147483647           |                           |
| valid_max                    | Valid maximum value  | NC_INT    | 2147483647            |                           |
| missing_value                | missing value  | NC_INT    | -2147483648           |                           |
| view_average_time_offset     | Sensing time of the centre wheel position per view.  | NC_SHORT  |                       | unique_viewing_directions |
| long_name                    | Variable long name   | NC_STRING | see Description       |                           |
| units                        | Physical units   | NC_STRING | s                     |                           |
| scale_factor                 | Scale factor to be applied   | NC_DOUBLE | 1.0                   |                           |
| add_offset                   | Offset to be applied   | NC_DOUBLE | 0.0                   |                           |
| valid_min                    | Valid minimum value  | NC_SHORT  | -143                  |                           |
| valid_max                    | Valid maximum value  | NC_SHORT  | 143                   |                           |
| missing_value                | missing value  | NC_SHORT  | -32768                |                           |
| viewing_directions_mask_VNIR | Boolean vector indicating which VNIR view, among the unique viewing directions, is available from a grid point J,I   | NC_BYTE   |                       | unique_viewing_directions |
| long_name                    | Variable long name   | NC_STRING | see Description       |                           |
| units                        | Physical units   | NC_STRING | 1                     |                           |
| scale_factor                 | Scale factor to be applied   | NC_DOUBLE | 1.0                   |                           |

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| Variables Name                     | Description  | Type      | Range or Value         | Dimension   |
|------------------------------------|--|-----------|------------------------|---|
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_BYTE   | 0                      |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_BYTE   | 1                      |   |
| <i>missing_value</i>               | missing value  | NC_BYTE   | -128                   |   |
| viewing_directions_mask_SWIR       | Boolean vector indicating which SWIR view, among the unique viewing directions, is available from a grid point J,I                                       | NC_BYTE   |                        | unique_viewing_directions<br>SWIR_overlaps          |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                       | Physical units   | NC_STRING | 1                      |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_BYTE   | 0                      |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_BYTE   | 1                      |   |
| <i>missing_value</i>               | missing value  | NC_BYTE   | -128                   |   |
| viewing_directions_mask_SWIR_index | Enumeration indicating which SWIR boolean vector applies to point J,I  | NC_BYTE   |                        | geo_reference_grid_cells                            |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                       | Physical units   | NC_STRING | 1                      |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_BYTE   | 0                      |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_BYTE   | 1                      |   |
| <i>missing_value</i>               | missing value  | NC_BYTE   | -128                   |   |
| satellite_sun_angle_coefficients   | fit coefficients for satellite/sun azimuth and zenith angles over the time range of all unique viewing directions [tau, dACT, azOff, qa0, ma1, qz0, mz1] | NC_DOUBLE |                        | geo_reference_grid_cells<br>angles_fit_coefficients |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_DOUBLE | TBD                    |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_DOUBLE | TBD                    |   |
| <i>missing_value</i>               | missing value  | NC_DOUBLE | 9.969209968386869e+36  |   |
| satellite_zenith_angle_error       | Root mean square error in the reconstruction of satellite zenith angle from coefficients   | NC_FLOAT  |                        | geo_reference_grid_cells                            |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                    |   |

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| Variables Name                       | Description   | Type      | Range or Value            | Dimension                |
|--------------------------------------|---|-----------|---------------------------|--------------------------|
| <i>valid_min</i>                     | Valid minimum value   | NC_FLOAT  | TBD                       |                          |
| <i>valid_max</i>                     | Valid maximum value   | NC_FLOAT  | TBD                       |                          |
| <i>missing_value</i>                 | missing value   | NC_FLOAT  | 9.969209968386869<br>e+36 |                          |
| <i>satellite_azimuth_angle_error</i> | Root mean square error in the reconstruction of satellite azimuth angle from coefficients | NC_FLOAT  |                           | geo_reference_grid_cells |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |                          |
| <i>units</i>                         | Physical units  | NC_STRING | degrees                   |                          |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |                          |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |                          |
| <i>valid_min</i>                     | Valid minimum value   | NC_FLOAT  | TBD                       |                          |
| <i>valid_max</i>                     | Valid maximum value   | NC_FLOAT  | TBD                       |                          |
| <i>missing_value</i>                 | missing value   | NC_FLOAT  | 9.969209968386869<br>e+36 |                          |
| <i>solar_zenith_angle_error</i>      | Root mean square error in the reconstruction of solar zenith angle from coefficients      | NC_FLOAT  |                           | geo_reference_grid_cells |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |                          |
| <i>units</i>                         | Physical units  | NC_STRING | degrees                   |                          |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |                          |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |                          |
| <i>valid_min</i>                     | Valid minimum value   | NC_FLOAT  | TBD                       |                          |
| <i>valid_max</i>                     | Valid maximum value   | NC_FLOAT  | TBD                       |                          |
| <i>missing_value</i>                 | missing value   | NC_FLOAT  | 9.969209968386869<br>e+36 |                          |
| <i>solar_azimuth_angle_error</i>     | Root mean square error in the reconstruction of solar azimuth angle from coefficients     | NC_FLOAT  |                           | geo_reference_grid_cells |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |                          |
| <i>units</i>                         | Physical units  | NC_STRING | degrees                   |                          |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |                          |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |                          |
| <i>valid_min</i>                     | Valid minimum value   | NC_FLOAT  | TBD                       |                          |
| <i>valid_max</i>                     | Valid maximum value   | NC_FLOAT  | TBD                       |                          |
| <i>missing_value</i>                 | missing value   | NC_FLOAT  | 9.969209968386869<br>e+36 |                          |
| <i>scattering_angle_error</i>        | Root mean square error in the reconstruction of scattering angle from coefficients        | NC_FLOAT  |                           | geo_reference_grid_cells |
| <i>long_name</i>                     | Variable long name  | NC_STRING | <i>see Description</i>    |                          |
| <i>units</i>                         | Physical units  | NC_STRING | degrees                   |                          |
| <i>scale_factor</i>                  | Scale factor to be applied  | NC_DOUBLE | 1.0                       |                          |
| <i>add_offset</i>                    | Offset to be applied  | NC_DOUBLE | 0.0                       |                          |
| <i>valid_min</i>                     | Valid minimum value   | NC_FLOAT  | TBD                       |                          |

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| Variables Name                     | Description  | Type      | Range or Value            | Dimension   |
|------------------------------------|--|-----------|---------------------------|---|
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | TBD                       |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>satellite_zenith_angle</i>      | satellite zenith angles for all grid points J,I and for all unique viewing directions                  | NC_FLOAT  |                           | geo_reference_<br>grid_cells<br>unique_viewing_<br>directions                 |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                   |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | 0.0                       |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | 90.0                      |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>solar_zenith_angle</i>          | solar zenith angles for all grid points J,I and for all unique viewing directions                      | NC_FLOAT  |                           | geo_reference_<br>grid_cells<br>unique_viewing_<br>directions                 |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                   |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | 0.0                       |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | 90.0                      |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>relative_azimuth_angle</i>      | relative azimuth angles (as azSun-azSat) for all grid points J,I and for all unique viewing directions | NC_FLOAT  |                           | geo_reference_<br>grid_cells<br>unique_viewing_<br>directions                 |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | degrees                   |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1.0                       |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_FLOAT  | -360.0                    |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_FLOAT  | 360.0                     |   |
| <i>missing_value</i>               | missing value  | NC_FLOAT  | 9.969209968386869<br>e+36 |   |
| <i>vii_scene_inhomogeneity_dir</i> | VII radiance inhomogeneity for all VNIR viewing directions   | NC_SHORT  |                           | geo_reference_<br>grid_cells<br>coloc_directions<br>vii_radiance_ch<br>annels |
| <i>long_name</i>                   | Variable long name   | NC_STRING | <i>see Description</i>    |   |
| <i>units</i>                       | Physical units   | NC_STRING | 1                         |   |
| <i>scale_factor</i>                | Scale factor to be applied   | NC_DOUBLE | 1e-4                      |   |
| <i>add_offset</i>                  | Offset to be applied   | NC_DOUBLE | 0.0                       |   |
| <i>valid_min</i>                   | Valid minimum value  | NC_SHORT  | 0                         |   |
| <i>valid_max</i>                   | Valid maximum value  | NC_SHORT  | 1000                      |   |
| <i>missing_value</i>               | missing value  | NC_SHORT  | -32768                    |   |

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| Variables Name                 | Description  | Type      | Range or Value  | Dimension   |
|--------------------------------|--|-----------|-----------------|---|
| vii_scene_inhomogeneity        | VII radiance inhomogeneity co-located straight to the grid J,I   | NC_SHORT  |                 | geo_reference_grid_cells<br>vii_radiance_channels |
| long_name                      | Variable long name   | NC_STRING | see Description |   |
| units                          | Physical units   | NC_STRING | 1               |   |
| scale_factor                   | Scale factor to be applied                                       | NC_DOUBLE | 1e-4            |   |
| add_offset                     | Offset to be applied   | NC_DOUBLE | 0.0             |   |
| valid_min                      | Valid minimum value  | NC_SHORT  | 0               |   |
| valid_max                      | Valid maximum value  | NC_SHORT  | 1000            |   |
| missing_value                  | missing value  | NC_SHORT  | -32768          |   |
| vii_cloud_fraction_dir         | VII geometric cloud fraction for all VNIR viewing directions     | NC_SHORT  |                 | geo_reference_grid_cells<br>coloc_directions      |
| long_name                      | Variable long name   | NC_STRING | see Description |   |
| units                          | Physical units   | NC_STRING | 1               |   |
| scale_factor                   | Scale factor to be applied                                       | NC_DOUBLE | 1e-4            |   |
| add_offset                     | Offset to be applied   | NC_DOUBLE | 0.0             |   |
| valid_min                      | Valid minimum value  | NC_SHORT  | 0               |   |
| valid_max                      | Valid maximum value  | NC_SHORT  | 1000            |   |
| missing_value                  | missing value  | NC_SHORT  | -32768          |   |
| vii_cloud_fraction             | VII geometric cloud fraction co-located straight to the grid J,I | NC_SHORT  |                 | geo_reference_grid_cells                          |
| long_name                      | Variable long name   | NC_STRING | see Description |   |
| units                          | Physical units   | NC_STRING | 1               |   |
| scale_factor                   | Scale factor to be applied                                       | NC_DOUBLE | 1e-4            |   |
| add_offset                     | Offset to be applied   | NC_DOUBLE | 0.0             |   |
| valid_min                      | Valid minimum value  | NC_SHORT  | 0               |   |
| valid_max                      | Valid maximum value  | NC_SHORT  | 1000            |   |
| missing_value                  | missing value  | NC_SHORT  | -32768          |   |
| vii_cloud_top_height_dir       | VII cloud-top height for all VNIR viewing directions             | NC_SHORT  |                 | geo_reference_grid_cells<br>coloc_directions      |
| long_name                      | Variable long name   | NC_STRING | see Description |   |
| units                          | Physical units   | NC_STRING | m               |   |
| scale_factor                   | Scale factor to be applied                                       | NC_DOUBLE | 1.0             |   |
| add_offset                     | Offset to be applied   | NC_DOUBLE | 0.0             |   |
| valid_min                      | Valid minimum value  | NC_SHORT  | 0               |   |
| valid_max                      | Valid maximum value  | NC_SHORT  | 32767           |   |
| missing_value                  | missing value  | NC_SHORT  | -32768          |   |
| vii_cloud_top_height_dir_error | Error on VII cloud-top height for all VNIR viewing directions    | NC_SHORT  |                 | geo_reference_grid_cells<br>coloc_directions      |
| long_name                      | Variable long name   | NC_STRING | see Description |   |
| units                          | Physical units   | NC_STRING | m               |   |
| scale_factor                   | Scale factor to be applied                                       | NC_DOUBLE | 1.0             |   |
| add_offset                     | Offset to be applied   | NC_DOUBLE | 0.0             |   |
| valid_min                      | Valid minimum value  | NC_SHORT  | 0               |   |

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| Variables Name                    | Description   | Type      | Range or Value         | Dimension   |
|-----------------------------------|---|-----------|------------------------|---|
| <i>valid_max</i>                  | Valid maximum value   | NC_SHORT  | 32767                  |   |
| <i>missing_value</i>              | missing value   | NC_SHORT  | -32768                 |   |
| <i>vii_cloud_top_height</i>       | VII cloud-top height co-located straight to the grid J,I          | NC_SHORT  |                        | geo_reference_grid_cells                          |
| <i>long_name</i>                  | Variable long name  | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                      | Physical units  | NC_STRING | m                      |   |
| <i>scale_factor</i>               | Scale factor to be applied  | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                 | Offset to be applied  | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                  | Valid minimum value   | NC_SHORT  | 0                      |   |
| <i>valid_max</i>                  | Valid maximum value   | NC_SHORT  | 32767                  |   |
| <i>missing_value</i>              | missing value   | NC_SHORT  | -32768                 |   |
| <i>vii_cloud_top_height_error</i> | Error on VII cloud-top height co-located straight to the grid J,I | NC_SHORT  |                        | geo_reference_grid_cells                          |
| <i>long_name</i>                  | Variable long name  | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                      | Physical units  | NC_STRING | m                      |   |
| <i>scale_factor</i>               | Scale factor to be applied  | NC_DOUBLE | 1.0                    |   |
| <i>add_offset</i>                 | Offset to be applied  | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                  | Valid minimum value   | NC_SHORT  | 0                      |   |
| <i>valid_max</i>                  | Valid maximum value   | NC_SHORT  | 32767                  |   |
| <i>missing_value</i>              | missing value   | NC_SHORT  | -32768                 |   |
| <i>land_fraction</i>              | Land fraction   | NC_SHORT  |                        | geo_reference_grid_cells<br>grid_coloc_directions |
| <i>long_name</i>                  | Variable long name  | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                      | Physical units  | NC_STRING | 1                      |   |
| <i>scale_factor</i>               | Scale factor to be applied  | NC_DOUBLE | 1e-4                   |   |
| <i>add_offset</i>                 | Offset to be applied  | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                  | Valid minimum value   | NC_SHORT  | 0                      |   |
| <i>valid_max</i>                  | Valid maximum value   | NC_SHORT  | 10000                  |   |
| <i>missing_value</i>              | missing value   | NC_SHORT  | -32768                 |   |
| <i>snow_ice_fraction</i>          | Snow/Ice fraction   | NC_SHORT  |                        | geo_reference_grid_cells<br>grid_coloc_directions |
| <i>long_name</i>                  | Variable long name  | NC_STRING | <i>see Description</i> |   |
| <i>units</i>                      | Physical units  | NC_STRING | 1                      |   |
| <i>scale_factor</i>               | Scale factor to be applied  | NC_DOUBLE | 1e-4                   |   |
| <i>add_offset</i>                 | Offset to be applied  | NC_DOUBLE | 0.0                    |   |
| <i>valid_min</i>                  | Valid minimum value   | NC_SHORT  | 0                      |   |
| <i>valid_max</i>                  | Valid maximum value   | NC_SHORT  | 10000                  |   |
| <i>missing_value</i>              | missing value   | NC_SHORT  | -32768                 |   |

**Table 18: /data/overlap\_xxx/geolocation\_data: Variables**

**4.5.3.5 Group Name: /data/overlap\_xxx/quality\_information**

**4.5.3.5.1 /data/overlap\_xxx/quality\_information: Variables**

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| Variables Name        | Description   | Type      | Range or Value  | Dimension                |
|-----------------------|---|-----------|-----------------|--------------------------|
| reflectance_I_quality | Quality information on reflectance for 3MI channels on grid point J,I; bit[0]: Missing measurement, bit[1:Nch]: Radiances are out of range or low quality or missing for view bit[16:16+Nac]                            | NC_INT    |                 | geo_reference_grid_cells |
| long_name             | Variable long name  | NC_STRING | see Description |                          |
| units                 | Physical units  | NC_STRING | 1               |                          |
| scale_factor          | Scale factor to be applied  | NC_DOUBLE | 1.0             |                          |
| add_offset            | Offset to be applied  | NC_DOUBLE | 0.0             |                          |
| valid_min             | Valid minimum value   | NC_INT    | 0               |                          |
| valid_max             | Valid maximum value   | NC_INT    | 1               |                          |
| missing_value         | missing value   | NC_INT    | -2147483648     |                          |
| reflectance_Q_quality | Quality information on reflectance for 90 deg polarized light for 3MI channels on grid point J,I; bit[0]: Missing measurement, bit[1:Nch]: Radiances are out of range or low quality or missing for view bit[16:16+Nac] | NC_INT    |                 | geo_reference_grid_cells |
| long_name             | Variable long name  | NC_STRING | see Description |                          |
| units                 | Physical units  | NC_STRING | 1               |                          |
| scale_factor          | Scale factor to be applied  | NC_DOUBLE | 1.0             |                          |
| add_offset            | Offset to be applied  | NC_DOUBLE | 0.0             |                          |
| valid_min             | Valid minimum value   | NC_INT    | 0               |                          |
| valid_max             | Valid maximum value   | NC_INT    | 1               |                          |
| missing_value         | missing value   | NC_INT    | -2147483648     |                          |
| reflectance_U_quality | Quality information on reflectance for 45 deg polarized light for 3MI channels on grid point J,I; bit[0]: Missing measurement, bit[1:Nch]: Radiances are out of range or low quality or missing for view bit[16:16+Nac] | NC_INT    |                 | geo_reference_grid_cells |
| long_name             | Variable long name  | NC_STRING | see Description |                          |
| units                 | Physical units  | NC_STRING | 1               |                          |
| scale_factor          | Scale factor to be applied  | NC_DOUBLE | 1.0             |                          |
| add_offset            | Offset to be applied  | NC_DOUBLE | 0.0             |                          |
| valid_min             | Valid minimum value   | NC_INT    | 0               |                          |
| valid_max             | Valid maximum value   | NC_INT    | 1               |                          |
| missing_value         | missing value   | NC_INT    | -2147483648     |                          |

**Table 19: /data/overlap\_xxx/Quality\_Information: Variables**

**4.5.3.6 Group Name: /data/overlap\_xxx/processing\_flags**

**4.5.3.6.1 /data/overlap\_xxx/processing\_flags: Variables**

| Variables Name                     | Description   | Type      | Range or Value  | Dimension   |
|------------------------------------|---|-----------|-----------------|---|
| view_timestamp_quality             | Timestamp of view v out of range  | NC_BYTE   |                 | unique_viewing_directions                             |
| long_name                          | Variable long name  | NC_STRING | see Description |   |
| units                              | Physical units  | NC_STRING | 1               |   |
| scale_factor                       | Scale factor to be applied  | NC_DOUBLE | 1.0             |   |
| add_offset                         | Offset to be applied  | NC_DOUBLE | 0.0             |   |
| valid_min                          | Valid minimum value   | NC_BYTE   | 0               |   |
| valid_max                          | Valid maximum value   | NC_BYTE   | 1               |   |
| missing_value                      | missing value   | NC_BYTE   | -128            |   |
| geometric_information_quality      | Out of range geometric quality indicator for grid point J,I               | NC_SHORT  |                 | geo_reference_grid_cells                              |
| long_name                          | Variable long name  | NC_STRING | see Description |   |
| units                              | Physical units  | NC_STRING | 1               |   |
| scale_factor                       | Scale factor to be applied  | NC_DOUBLE | 1.0             |   |
| add_offset                         | Offset to be applied  | NC_DOUBLE | 0.0             |   |
| valid_min                          | Valid minimum value   | NC_SHORT  | 0               |   |
| valid_max                          | Valid maximum value   | NC_SHORT  | 32768           |   |
| missing_value                      | missing value   | NC_SHORT  | -32768          |   |
| colocation_information_quality     | Out of range co-location quality indicator for grid point J,I             | NC_SHORT  |                 | geo_reference_grid_cells                              |
| long_name                          | Variable long name  | NC_STRING | see Description |   |
| units                              | Physical units  | NC_STRING | 1               |   |
| scale_factor                       | Scale factor to be applied  | NC_DOUBLE | 1.0             |   |
| add_offset                         | Offset to be applied  | NC_DOUBLE | 0.0             |   |
| valid_min                          | Valid minimum value   | NC_SHORT  | 0               |   |
| valid_max                          | Valid maximum value   | NC_SHORT  | 32768           |   |
| missing_value                      | missing value   | NC_SHORT  | -32768          |   |
| colocation_information_quality_dir | Out of range directional co-location quality indicator for grid point J,I | NC_SHORT  |                 | geo_reference_grid_cells<br>unique_viewing_directions |
| long_name                          | Variable long name  | NC_STRING | see Description |   |
| units                              | Physical units  | NC_STRING | 1               |   |
| scale_factor                       | Scale factor to be applied  | NC_DOUBLE | 1.0             |   |
| add_offset                         | Offset to be applied  | NC_DOUBLE | 0.0             |   |
| valid_min                          | Valid minimum value   | NC_SHORT  | 0               |   |
| valid_max                          | Valid maximum value   | NC_SHORT  | 32768           |   |
| missing_value                      | missing value   | NC_SHORT  | -32768          |   |

**Table 20: /data/overlap\_xxx/processing\_flags: Variables**

#### 4.5.4 Group Name: */quality*

##### 4.5.4.1.1 */quality*: Attributes

| Attribute Name       | Type      | Meaning and/or value  |
|----------------------|-----------|---|
| overall_quality_flag | NC_USHORT | "0" if overall quality is OK<br>Bit 0: Missing input product(s)<br>Bit 1: Data gap(s)<br>Bit 2: Corrupted input product(s)<br>Bit 3: Instrument anomaly<br>Bit 4: missing or degraded auxiliary data)<br>Bit 5-15: not used |

*Table 21: /quality: Attributes*

##### 4.5.4.2 */quality*: Dimensions

| Dimension Name | Description   | Range or Value |
|----------------|---|----------------|
| gap_items      | Number of gaps indentified during product duration. | TBD            |

##### 4.5.4.2.1 */quality*: Variables

| Variables Name                  | Description                                 | Type      | Range or Value         | Dimension |
|---------------------------------|---|-----------|------------------------|-----------|
| counter_of_raised_quality_flags | Counter of quality flags raised per overlap | NC_INT    |                        | overlaps  |
| long_name                       | Variable long name                          | NC_STRING | <i>see Description</i> |           |
| units                           | values                                      | NC_STRING | 1                      |           |
| scale_factor                    | Scale factor to be applied                  | NC_DOUBLE | 1.0                    |           |
| add_offset                      | Offset to be applied                        | NC_DOUBLE | 0.0                    |           |
| valid_min                       | Valid minimum value                         | NC_INT    | 0                      |           |
| valid_max                       | Valid maximum value                         | NC_INT    | 2147483647             |           |
| missing_value                   | missing value                               | NC_INT    | -2147483648            |           |
| duration_of_product             | Entire duration of product                  | NC_DOUBLE |                        | 1         |
| long_name                       | Variable long name                          | NC_STRING | <i>see Description</i> |           |
| units                           | values                                      | NC_STRING | s                      |           |
| scale_factor                    | Scale factor to be applied                  | NC_DOUBLE | 1.0                    |           |
| add_offset                      | Offset to be applied                        | NC_DOUBLE | 0.0                    |           |
| valid_min                       | Valid minimum value                         | NC_DOUBLE | 0.0                    |           |
| valid_max                       | Valid maximum value                         | NC_DOUBLE | 10000.0                |           |
| missing_value                   | missing value                               | NC_DOUBLE | 9.969209968386869e+36  |           |
| duration_of_data_present        | Amount of data present in product           | NC_DOUBLE |                        | 1         |
| long_name                       | Variable long name                          | NC_STRING | <i>see Description</i> |           |
| units                           | values                                      | NC_STRING | s                      |           |

**EPS-SG 3MI Level 1C Product Format Specification**

| Variables Name                   | Description                        | Type      | Range or Value                        | Dimension |
|----------------------------------|------------------------------------|-----------|---------------------------------------|-----------|
| <i>scale_factor</i>              | Scale factor to be applied         | NC_STRING | 1.0                                   |           |
| <i>add_offset</i>                | Offset to be applied               | NC_DOUBLE | 0.0                                   |           |
| <i>valid_min</i>                 | Valid minimum value                | NC_DOUBLE | 0.0                                   |           |
| <i>valid_max</i>                 | Valid maximum value                | NC_DOUBLE | 10000.0                               |           |
| <i>missing_value</i>             | missing value                      | NC_DOUBLE | 9.969209968386869e+36                 |           |
| <i>duration_of_data_missing</i>  | Amount of data missing in product  | NC_DOUBLE |                                       | 1         |
| <i>long_name</i>                 | Variable long name                 | NC_STRING | <i>see Description</i>                |           |
| <i>units</i>                     | values                             | NC_STRING | s                                     |           |
| <i>scale_factor</i>              | Scale factor to be applied         | NC_DOUBLE | 1.0                                   |           |
| <i>add_offset</i>                | Offset to be applied               | NC_DOUBLE | 0.0                                   |           |
| <i>valid_min</i>                 | Valid minimum value                | NC_DOUBLE | 0.0                                   |           |
| <i>valid_max</i>                 | Valid maximum value                | NC_DOUBLE | 10000.0                               |           |
| <i>missing_value</i>             | missing value                      | NC_DOUBLE | 9.969209968386869e+36                 |           |
| <i>duration_of_data_degraded</i> | Amount of data degraded in product | NC_DOUBLE |                                       | 1         |
| <i>long_name</i>                 | Variable long name                 | NC_STRING | <i>see Description</i>                |           |
| <i>units</i>                     | values                             | NC_STRING | s                                     |           |
| <i>scale_factor</i>              | Scale factor to be applied         | NC_DOUBLE | 1.0                                   |           |
| <i>add_offset</i>                | Offset to be applied               | NC_DOUBLE | 0.0                                   |           |
| <i>valid_min</i>                 | Valid minimum value                | NC_DOUBLE | 0.0                                   |           |
| <i>valid_max</i>                 | Valid maximum value                | NC_DOUBLE | 10000.0                               |           |
| <i>missing_value</i>             | missing value                      | NC_DOUBLE | 9.969209968386869e+36                 |           |
| <i>gap_start_time_utc</i>        | Gap start time in UTC              | NC_DOUBLE |                                       | gap_items |
| <i>long_name</i>                 | Variable long name                 | NC_STRING | <i>see Description</i>                |           |
| <i>units</i>                     | values                             | NC_STRING | seconds since 2020-01-01 00:00:00.000 |           |
| <i>scale_factor</i>              | Scale factor to be applied         | NC_DOUBLE | 1.0                                   |           |
| <i>add_offset</i>                | Offset to be applied               | NC_DOUBLE | 0.0                                   |           |
| <i>valid_min</i>                 | Valid minimum value                | NC_DOUBLE | -2500000000                           |           |
| <i>valid_max</i>                 | Valid maximum value                | NC_DOUBLE | 2500000000                            |           |
| <i>missing_value</i>             | missing value                      | NC_DOUBLE | 9.969209968386869e+36                 |           |
| <i>gap_end_time_utc</i>          | Gap end time in UTC                | NC_DOUBLE |                                       | gap_items |
| <i>long_name</i>                 | Variable long name                 | NC_STRING | <i>see Description</i>                |           |
| <i>units</i>                     | values                             | NC_STRING | seconds since 2020-01-01 00:00:00.000 |           |
| <i>scale_factor</i>              | Scale factor to be applied         | NC_DOUBLE | 1.0                                   |           |

**EPS-SG 3MI Level 1C Product Format Specification**

| <b>Variables Name</b> | <b>Description</b>   | <b>Type</b> | <b>Range or Value</b> | <b>Dimensio<br/>n</b> |
|-----------------------|----------------------|-------------|-----------------------|-----------------------|
| <i>add_offset</i>     | Offset to be applied | NC_DOUBLE   | 0.0                   |                       |
| <i>valid_min</i>      | Valid minimum value  | NC_DOUBLE   | -2500000000           |                       |
| <i>valid_max</i>      | Valid maximum value  | NC_DOUBLE   | 2500000000            |                       |
| <i>missing_value</i>  | missing value        | NC_DOUBLE   | 9.969209968386869e+36 |                       |

**Table 22: /quality: Variables**

## 5 PRODUCT FORMAT VERSION CONTROL

This section provides *Product Format Version Control Numbers* for the 3MI L1C radiance product defined within this document (see Table 23). This version is reflected in the following global attribute present in each EPS-SG mission product centrally generated as described in the [GPFS]:

| <b>Product ID</b> | <b>Product Format Version Control Number<br/>(format_version)</b> | <b>Product Format Specification Issue<br/>(pfs_reference_and_version)</b> | <b>Generic Product Format Specification Issue<br/>(gpfs_reference_and_version)</b> |
|-------------------|---|---|--|
| <i>3MI-1C-RAD</i> | <i>0.0</i>  | <i>1A</i>   | <i>1E</i>  |
|                   | <i>1.0</i>  | <i>1B</i>   | <i>1H</i>  |
|                   | <i>2.0</i>  | <i>2A</i>   | <i>2A</i>  |
|                   | <i>3.0</i>  | <i>3C</i>   | <i>3C</i>  |

**Table 23: Record Format Version Numbers**

As described in the [GPFS], the *Product Format Version Control Number* is updated whenever there is a change in the format or contents of a product that requires an update to software that has to read the product or has to check the product. This could be a change in the format itself (element is deleted, added, resized, re-typed,...), a change in the contents of an element (e.g. scale factor change) or a change in the way that element has to be interpreted. Any such element update requires the product format version number to be incremented.

A recommended way to use *major.minor* versions of the product format version control number both is to issue minor updates for a change resulting from a PFS update, and major updates for a change resulting from GPFS updates that affect all products. Then a GPFS update would reset all products back to a new major of (say) 12.0, and then 12.1, 12.2 etc. versions would indicate PFS-only updates.

**APPENDIX A            SIZE OF 3MI-1C-RAD PRODUCT**

This appendix provides an estimated size of the EPS-SG 3MI Level 1C product.

The product size will depend on the configuration of the target output geo-reference sinusoidal grid and on the VNIR/SWIR configuration which determines the maximum number of views accumulated, as detailed in [3MI-L1C-PGS].

For a standard configuration of the output sinusoidal grid, a L1C product covering one orbit will have a size of 6000 MB per orbit, as shown in Table 24. A more detailed discussion on product size is given in [3MI-L1C-PGS].

| <b>Product ID</b> | <b>Product Description</b>  | <b>Size (MB/Orbit)</b> |
|-------------------|---|------------------------|
| <b>3MI-1C-RAD</b> | 3MI Level 1C Product, based on a day-side orbit of 50 minutes and a target grid resolution of 3.97 km | 6000                   |

***Table 24: Size of the 3MI Level 1C Product***

**APPENDIX B XML DESCRIPTION OF 3MI-1C-RAD PRODUCTS FORMAT**

The XML description of the NetCDF-4 EPS-SG 3MI L1C product is attached below.



EPS-SG-PFS-3MI-1C-RAD\_v3b.xml

**APPENDIX C LIST OF TBD & TBCS**

| <b>ID</b> | <b>Section</b> | <b>Title</b> | <b>Text</b> |
|-----------|----------------|--------------|-------------|
| TBD-01    |                |              |             |
| TBD-02    |                |              |             |

| <b>ID</b> | <b>Section</b>      | <b>Title</b>   | <b>Text</b>  |
|-----------|---------------------|--|--|
| TBC-01    | All variable tables | Use of _FillValue  | So far the missing_value is used, this could be maybe replaced by _FillValue, but not yet decided.   |
| TBC-02    | 4.3                 | Satellite and other attributes status valid min/max values | Maximum and minimum as well as missing values of various satellite status and other attributes   |
| TBC-03    | 4.5.3.6.1           | Processing Flag Meanings                                   | The flags specified within the /data/overlap_xxx/processing_flags group are not expanded with respect to the meaning of each flag bit. See [3MI-L1C-PGS] for details |