PREPARATION AND OPERATIONS OF THE MISSION PERFORMANCE CENTRE

(MPC) FOR THE COPERNICUS SENTINEL-3 MISSION

Product Data Format Specification - SLSTR Level 2

Land Products

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AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

Amendment Record Sheet

ISSUE	DATE	REASON
1.0	01 Oct 2012	IPF DR1 Release
1.1	18 Dec 2012	Account for IPF DR1 and IPF DR2 update
1.2	12 Feb 2013	Change of Template
1.4	04 Dec 2013	DR2 update
1.5	24 Mar 2014	RIDs and SPRs correction update
1.6	15 May 2014	Consolidation of SLSTR PFS
1.7	30 July 2014	Information package map update
1.8	13 Oct 2014	Feedback from Validation phase
1.9	23 Nov 2014	Review the product size assessment assumptions and corresponding sizes
1.10	10 Feb 2015	Reference update, GHRSST specification update, Product size completion
	23 March 2015	Account for Agencies feedback
1.11	28 May 2015	Implementation of the launch critical changes
2.0	20 May 2016	Implementation of the Minor Changes
2.1	20 June 2016	Implementation of the RIDs correction
2.2	27 June 2016	Implementation of corrections raised at IPFP V3 TRR
2.3	25 October 2016	Minimum and maximum values of the scan number before the reset of the counter when crossing the ANX included as variable attributes in SLSTR Level 1 time_*.nc files.
2.4	27 March 2017	Update of the radiometric uncertainty long_name
2.5	02 May 2017	Addition of a specific tidal flag in L2P product in replacement of volcanic one. correction of the L2P attributes
2.6	09 Oct 2017	Documentation split into: L1, L2 land and L2 marine volumes
2.7	23 January 2018	Inclusion of the Bayesian and Probabilistic Cloud masks and suppression of the FRP section

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Document Change Record

No.	Change in Issue	Description	Affected Section
1	1.1	S3IPF-372: L1 Browse format is not described in details.	
2	1.1	S3IPF-390: L1 Browse format is not described in details.	
3	1.1	S3IPF-391: editorial errors corrected in the document.	
4	1.1	S3IPF-393: reference document updated.	
5	1.1	S3IPF-414: metadata description has been moved to the Metadata specification document. Document is referenced. The list of parameters has been updated according to the DPM V2.	
6	1.1	S3IPF-450: global attributes are referred to from the "product structures" volume of the PDS.	
7	1.1	S3IPF-461: manifest name renamed to xfdumanifest.xml	
8	1.1	S3IPF-470: - Long_name will be deleted everywhere. The rule will be to use the description of the variable to fill them - Scale/offset are defined via processing parameters	
9	1.1	S3IPF-474: in met_tx.nc file, suffix <g><v> replaced with tx. Note on t_forecast presence and empty when not applicable.	
10	1.1	S3IPF-475: manifest section reviewed.	
11	1.1	S3IPF-485: global attributes are referred to from the "product structures" volume of the PDS. All justification for not including all attributes are in this document.	
12	1.1	S3IPF-507: column availability to the user removed.	
13	1.1	S3IPF-512: TOC reviewed.	
14	1.1	S3IPF-513: corrupted sections corrected.	
15	1.1	S3IPF-520: add caption to tables, correct TOC errors.	
16	1.2	Change of template	Entire document
17	1.3	S3IPF-390: secondary metadata reference for browse products removed	4.3
18	1.3	S3IPF-457: improve brawse product description	4.3.3
19	1.3	S3IPF-461: manifest name renamed to xfdumanifest.safe	4.2.1, 4.3.2
20	1.3	GDS/GHRSST version update (S3IPF-1381)	1.3.1

No.	Change in Issue	Description	Affected Section
22	1.3	S3IPF-922: change manifest name in table 4-1 and link to section	4.2.1
23	1.3	S3IPF-695: AD and RD lists updated	1.3
24	1.3	S3IPF-696: include a description of the secondary metadata	4.1.2
25	1.3	S3IPF-697: Section renamed manifest file	4.2.1.2
26	1.3	S3IPF-698: Section OLQC removed	4.2.5.10
27	1.3	S3IPF-700: Reference to AD-4 removed	4.3
28	1.3	S3IPF-701: Reference to AD-4 changed to AD-3	5.2
29	1.3	S3IPF-702: Reference to AD-4 changed to AD-3	5
30	1.3	S3IPF-703: package map update	5.1.2
31	1.3	S3IPF-704: Harmonization of the L1 product sizes	7.1.1
32	1.3	S3IPF-895 and 945: description of wind_speed corrected, field source put back	4.2.3.3.1
33	1.3	S3IPF-897: description of the LST package completed	4.2.4.1
34	1.3	S3IPF-935: Reference to LS exception flag reported in product description and table moved to LST section	4.2.4.3.1
35	1.3	S3IPF-936: "Range or Value" for the biome/biome_orphan fields specified	4.2.4.3.3
36	1.3	S3IPF-937: LST_ancillary data file moved to a new section "Annotation data files"	4.2.4.3.3
37	1.3	S3IPF-946: Clarification in the description of brightness temperature : Nadir only	4.2.3.4.1
38	1.3	S3IPF-948: update description of thermal_radiation_tx variable	4.2.5.9

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39	1.4	SLSTR Continuity: Modification of the grid indexation and content of some L1/common annotations files: - Quality Annotation Data files are now indexed by line, detector and integrators - Cartesian and geodetic files are now indexed on the image grid. Parameters associated with orphan pixels have been added - Time annotations provides one time stamp per line, a time offset for each columns and the time interval needed to processed each line The indexation of orphan pixels is now similar to the one included in OLCI : one vector per line. The resolution of tie point grid is now equals to 1km on along-track direction and 16km on across-track one. The estimated size of each file has been modified accordingly	4.2.1 4.2.5 7.1.1
40	1.5	Information package map and data object section update	5.1, 5.2, 5.3
41	1.6	SLSTR Continuity, Update of the Level 2 files (indexation of the orphan pixel	4.2.2, 4.2.3, 4.2.4
42	1.6	Update of the product size	7
43	1.6	Review of all document and addition of missing information from prototype specifications	
44	1.6	Remove all TBC in the whole document	
45	1.6	Correction of the "range/value" of biome/biome_orphan	4.2.4.1.1
46	1.6	Update of AD reference	1.3.1
47	1.7	Information package map and data object section update	5.1, 5.2, 5.3
48	1.8	Add_offset associated with pixel indices should be removed as it is always equal to 0	4.2.5
49	1.8	A note has been added to underline the fact that product limits are provided as example (configurable through PCP)	4.2.2
50	1.9	Review the product size assumptions	7
51	1.9	Review the product size	7.1, 7.2
52	1.9	Correct typo	7.1.1
53	1.10	Reference update	1.3
54	1.10	GHRSST specification update	4.2.3
55	1.10	Product size completion	7

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56	1.10	Corrections due to the updated nominal configuration : A and B stripe are always processed instead of TDI	4.2.1.1.1 4.2.1.4.1 4.2.5
57	1.11	Addition of the Ozone parameter in the meteo annotations files	4.2.5.9
58	1.11	Addition of specific global attributes for SLSTR L1 and L2 files	4.1.3 4.2
59	2.0	Addition of new parameters in quality annotation files (Thermal and VIS-SWIR)	4.2.1.4.1 4.2.1.4.2
60	2.0	Addition of the Snow Albedo content in Meteo file	4.2.5.9
61	2.0	Addition of the dual minus nadir sst differences and of the associated nadir sst theoretical error in the L2P file	4.2.3.4.1
62	2.0	Replacement of spare in L2P_flags by volcanic aerosol	4.2.3.4.1
63	2.0	Modification of the L2P_flags and creation of the SST algorithm types parameter	4.2.3.4.1
64	2.1	S3IPF – 2197 : addition of a the filling rule for long_name and verification of the variables description.	4.2.3.4.1
65	2.1	S3IPF – 2195 = modification of the (nadir_)sst_theoretical_error to uncertainty	4.2.3.4.1
66	2.1	S3IPF – 2196 = addition of the time dimension on dual_nadir_sst_difference and nadir_sst_theoretical_error	4.2.3.4.1
67	2.1	S3IPF – 2193 = inversion between ni and nj	4.2.3.4.1
68	2.1	S3IPF – 2199 = addition of a description table for dual minus nadir SST difefrence	4.2.3.4.1
69	2.1	S3IPF – 2192 = clarification of the channel dimension in the description of brightness temperature and in the comment attributes	4.2.3.4.1
70	2.1	S3IPF – 2194 = addition of flag_meanings and flag_values in the attributes of sst_algorithm_types	4.2.3.4.1
71	2.1	S3IPF – 2198 = change of the attributes of dt_analysis	4.2.3.4.1
72	2.2	Correction following the IPF V3 TRR : * correction of the fillValue and type of satellite zenith angle * addition of the channel repartition in nedt comment attributes	4.2.3.4.1
73	2.3	Minimum and maximum values of the scan number before the reset of the counter when crossing the ANX included as variable attributes in SLSTR Level 1 time_*.nc files.	4.2.5.7

No.	Change in Issue	Description	Affected Section
74	2.4	Update of the radiometric uncertainty long_name (SIIIMPC-1368)	4.2.1.5
75	2.5	Addition of a specific Tidal flag in L2P_flags (SIIIMPC-1698)	
76	2.5	Correction of the L2P attributes	
77	2.6	Common and Level 2 Land information are gathered in a separate document	
78	2.7	Inclusion of probability_cloudy_dual and single view in the global flags files	4.2.1.1
79	2.7	Inclusion of the L0_scan_offset in indices files	4.2.1.2
80	2.7	Suppression of the FRP files (specific document delivered in the frame of New Product activity)	7.1.1

1. INTRODUCTION

1.1 Purpose and Scope

This document aims to identify and specify the format of the Sentinel 3 SLSTR Level 2 Land products, browse products included.

1.2 Structure of the Document

After this introduction, the document is divided into a number of major sections that are briefly described below:

Chapter Number	Title	Contents
1	INTRODUCTION	This section
2	OVERVIEW OF THE INSTRUMENT: SLSTR	A description of the main features and characteristics of the SLSTR instrument is provided here.
3	PRODUCT OVERVIEW	The Product Tree for SLSTR instruments and the product names convention are specified here.
4	SLSTR PRODUCT FORMAT: COMMON PART	In this section the format of each SLSTR common elements is specified. NetCDF Data Files of each product are reported in this section.
5	MANIFEST FILE: COMMON PART	In this section details for the implementation of the common part of the manifest file is provided.
6	XML SCHEMAS	In this section details of the schemas used to generate the manifest is provided.
7	SLSTR PRODUCT FORMAT SPECIFICATION	In this section the format of each SLSTR Level 2 Land Product is specified.
8	MANIFEST FILE DESCRIPTION	In this section details for the implementation of the manifest file is provided
9	PRODUCT SIZE	In this section the size of each file composing the SLSTR products is provided.

Table 1-1: Document Structure

1.3 Applicable and Reference Documents

1.3.1 Applicable documents

The following table lists the documents with a direct bearing on the content of this document.

ID	Document	Reference
AD- 1	Sentinel 3 PDGS File Naming Convention	EUM/LEO-SEN3/SPE/10/0070 GMES-S3GS-EOPG-TN-09-0009, 1.4, 24/06/2016
AD- 2	Drivers for the S3 PDGS Processing Function Implementation	GMES-GSEG-EOPG-TN-11-0062, i1r7, 27/06/2014
AD- 3	Product Data Format Specification - Product Structures	S3IPF.PDS.002, Issue 1.7, 09/10/2017
AD- 4	Metadata Specification, Excel document	S3IPF.PDS.008, i3r4 – 09/10/2017
AD- 5	XML Schemas.zip – Zip file containing all the schemas used to represent the metadata	S3IPF PDS 009, i3r1 – 09/10/2017
AD- 6	Auxiliary Data Format Specification – SLSTR Level 2	S3IPF.PDS.007.3, i2r10 23/01/2018
AD- 7	Sentinel SAFE Control Book volume 1 – Core Specifications	GAEL-P264-DOC-0001-01-01, i1r1, 05/06/2012
AD-8	Product Data Format Specification – SLSTR Level 1	S3IPF.PDS.005.1, Issue 2.7, 26/01/2018
AD-9	Product Data Format Specification – SLSTR Level 2 Marine	S3IPF.PDS.005.3, Issue 2.7, 23/01/2018

1.3.2 Reference documents

The following reference documents contain information supporting this document.

ID	Document	Reference
RD- 1	CCSDS 661.0-B-0 XFDU structure and construction rules	Issue Sept. 2008
RD- 2	Product Data Format Specification - Level 0	S3IPF.PDS.001, I1R8, 09/10/2017
RD- 3	Sentinel 3 Level 0, Level 1a/b/c Products Definition Part 2: Optical Products. Volume 3: SLSTR Products (SY-4)	S3-RS-RAL-SY-0003, i6r2, 23/08/2013
RD- 4	Sentinel-3 Optical products and Algorithm Definition: SLSTR Level 2 Product Definition	S3-L2-SD-05-T-RAL-PD, i2r5, 12/10/2012
RD- 5	Sentinel-3 Optical products and Algorithm Definition: SLSTR Input Output Data Definition Document	S3-L2-SD-08-T-RAL-IODD, i2r8, 08/10/2012
RD- 6	GDS 2.0 Technical Specifications, http://www.ghrsst.org/documents.htm,	2.0 rev 05, 09/10/2012

1.4   Terms, Definitions and Abbreviated Terms

Terms, Definitions and Abbreviated Terms are identified in the common volume of the product format specifications in [AD- 3].

2. OVERVIEW OF THE INSTRUMENT: SLSTR

The products specified in this document refer to the processed data coming from the SLSTR instrument on-board Sentinel 3 satellite.

The Sentinel SLSTR instrument is a 11-channel radiometer configured as follows:

- 3 thermal infra-red channels at 3.7, 10.8 and 12 micron wavelengths;

- 2 fire channels at 3.7, and 10.8 micron wavelengths;

- 6 short-wave and visible channels at 2.25, 1.6, 1.375, 0.87, 0.67 and 0.55 micron wavelengths.

The instrument uses two independent scan mirrors each scanning at 200 scans per minute, but each scan measures two along-track pixels of 1 km (and eight pixels at 500 m resolution) simultaneously, thus providing 500-meter resolution in the reflectance channels.

Each scan mirror is mounted at an oblique angle to its axis of rotation and directs radiation into a telescope assembly the optical axis of which is aligned parallel to the rotation axis. As the scan mirror rotates, the line of sight traces out a cone whose intersection with the Earth traces out the measurement swath of the instrument. The scan cone will intersect the Earth view, the two calibration black bodies, and the Visible Calibration (VISCAL) Unit, so that the line of sight will encounter each of these once during a complete rotation.

Radiation incident along the line of sight enters the focal plane assembly, where it is split into frequency bands corresponding to the different channels. Radiation in each channel is focussed onto a small array of detector elements, which correspond to pixels.

SLSTR is an upgraded and advanced version of the AATSR instrument on Envisat, offering a wider swath, which completely overlaps the OLCI swath, as required to produce accurate vegetation products. The SLSTR is designed for ocean and land-surface temperature observations.

3. PRODUCT OVERVIEW

A graphical representation of the product tree for SLSTR instrument is provided in Figure 2-1
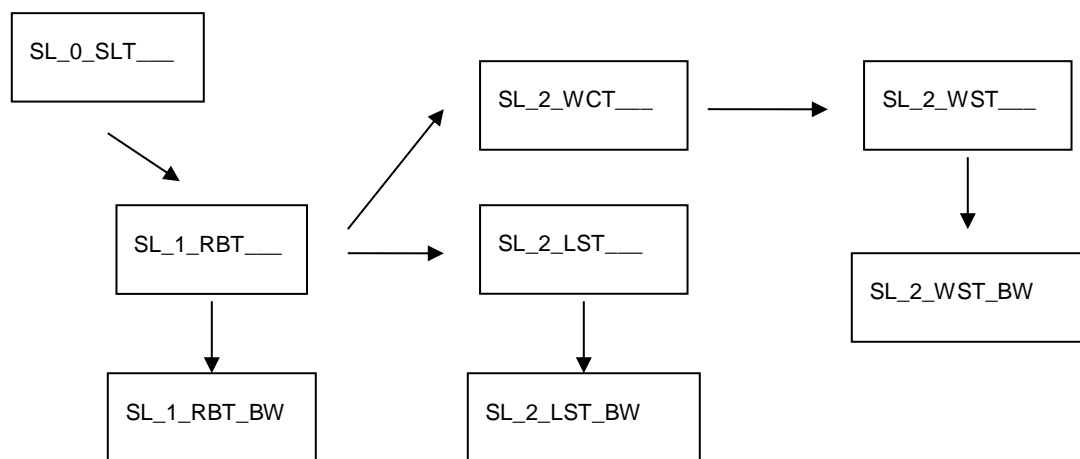
Figure 2-1: SLSTR Product Tree

SLSTR L0 products are described in [RD- 2].

The Level 1 product is detailed in [AD-8] and the Level 2 Land in [AD-9].

3.1 Product Tree

3.1.1 Science Product Tree

The S-3 SLSTR products are summarised in Table 2-1.

Product type	Description	Level
SL_1_RBT___	Brightness temperatures and radiances	Level 1
SL_2_WCT___	Sea Surface Temperatures (single view/ channels 2 and 3; dual view/ channels 2 and 3; aerosol-robust/ channel 3)	Level 2 Marine
SL_2_WST___	Level 2P Sea Surface Temperature (GHRSST like)	Level 2 Marine
SL_2_LST___	Land Surface Temperature geophysical parameters	Level 2 Land

Table 2-1: SLSTR Product Tree

3.1.2 Browse Product Tree

Browse Products are meant to support the analysis of quality and suitability of the optical products only. One or more browse products can be associated to each single product type.

The SLSTR Browse Product Tree is the following:

Product type	Description	Main Product	Subsampled Parameters
SL_1_RBT_BW	Quick Look of Brightness temperatures and radiances	SL_1_RBT___	• Nadir View Brightness Temperature • Nadir View Radiance
SL_2_WST_BW	Quick Look of Level 2P Sea Surface Temperature (GHRSST like)	SL_2_WST___	• Sea Surface Temperature
SL_2_LST_BW	Quick Look of Land Surface Temperature geophysical parameters	SL_2_LST___	• Land Surface Temperature

Table 2-2: SLSTR Browse Product Tree

3.2 Product Naming Convention

The names of the SLSTR products comply with the Sentinel 3 file naming convention according to [AD- 1].

4. SLSTR PRODUCT FORMAT SPECIFICATION: COMMON PART

4.1 General Product Structure

4.1.1 Package Layout

The format of every Sentinel 3 product is described in [AD- 3]. The Product Package is sketched in Figure 3-1.
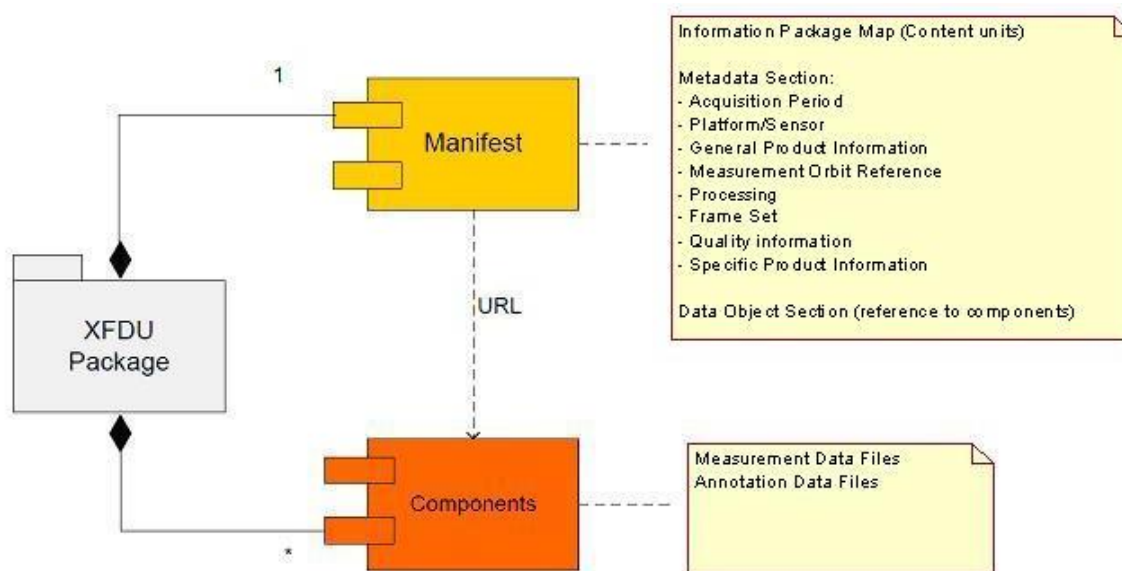
Figure 3-1: XFDU package

In the following sections, the physical composition of each package is specified for the SLSTR instrument.

According to [AD- 2], some files (measurement and annotation data files) are not generated during operations and their production can be activated by configuration of the processing chain. The column "N.O." in the tables of the following sections indicates these "Not Operational" products.

4.1.2 Manifest file

The manifest file is a set of metadata information related to the description of the product. It includes a common structure section, called primary metadata, and a specific section called secondary metadata.

4.1.2.1 Primary Metadata

The primary metadata is contained in various wrapped metadata units within the Sentinel-SAFE manifest: "acquisitionPeriod", "platform", " generalProductInformation ", "orbitRerence", "processing", "qualityInformation", "frameSet" and "slstrlProductInformation".

The fields are described in [AD- 3].

4.1.2.2 Secondary Metadata

The secondary metadata section contains the information specific to the instrument, level or mode applied during the processing.

4.1.3 Measurement Data Files and Annotation Data Files

The format of the measurement and the annotation data files is NetCDF 4.

A NetCDF file contains dimensions, variables, and attributes, which all have both a name by which they are identified. These components can be used together to capture the meaning of data and relations among data fields in an array-oriented data set.

The global attributes defined for each netCDF file composing the products are fully defined in the common volume of the product data format specification documents named "Product structures" and referenced as [AD- 3].

4.1.3.1 Common additional global attributes

Additional global attributes common to all SLSTR files are specifically defined. These attributes aims to ensure the self-containment of the dataset. There are defined in the following table and their value should be adapted according to the file.

Element name	Description	T	D
absolute_orbit_number	Absolute orbit number during which data contained within the product have been acquired	i32	1
start_time	Product start date and time (yyyy-mm-ddThh:mm:ss.ssssssZ)	S	1
stop_time	Product stop date and time (yyyy-mm-ddThh:mm:ss.ssssssZ)	S	1
comment	Miscellaneous extra information (empty)	S	1
resolution	Dataset resolution (across- and along-track) in meters unit function of the associated grid and view	S	1
start_offset	along-track position relative to ANX in pixels units, function of the associated grid and view	i32	1
track_offset	across-track position relative to SSP in pixels units function of on the associated grid and view	i32	1

Table 3-1: Additional Global Attributes for SLSTR L1 and L2 files

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4.2   Earth Observation Products

4.2.1 Common Annotation Data Files

In the following sections, the content of the common ADS (annotation datasets) is detailed.

4.2.1.1   Global Flags Data File

The Global Flags Annotation Data files contain the product quality flags that are applicable across all measurement datasets sharing the same view and detector geometry. There are at most eight global flag files, two at 1km resolution (nadir and oblique views) and six at 500m resolution (nadir and oblique views, "A stripe" and "B stripe" – nominal configuration - and TDI if selected). The format of each of them is identical but the array sizes and the values of some attributes differ, rows and columns could be different for A and B stripes, along track array size is dependent on the time interval defined in the Job Order.

Concerning Cloud detection, two detection approaches have been implemented and their results are included in this file

- The probabilistic Cloud detection module dedicated to LST processing chain and computed on the 1 km image grid
- The Bayesian Cloud detection module dedicated to SST processing chain and computed on the 1 km image grid

Element name	Description	Range or value	T	D
rows	Along track grid size			
columns	Across track grid size			
orphan_pixels	Maximum Number of un-regridded (orphaned) pixels on each image line			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
Probability_cloud_single_i<v>	Probability of cloud in pixel (single view)	[-100, 100]	i16	rows columns
_FillValue	Value indicating missing data	-32768		1

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Element name		Description	Range or value	T	D
scale_factor		Scaling factor used in decoding packed data	0.005		1
add_offset		Offset used to in decoding packed data	0.5		1
comment		comment	Probability of cloud in pixel as estimated by Bayesian Cloud detection on a single view		1
Probability_cloud_dual_i<v>		**Probability of cloud in pixel (dual view)**	**[-100, 100]**	**i16**	**rows columns**
_FillValue		Value indicating missing data	-32768		1
scale_factor		Scaling factor used in decoding packed data	0.005		1
add_offset		Offset used to in decoding packed data	0.5		1
comment		comment	Probability of cloud in pixel as estimated by Bayesian Cloud detection on both views		1
cloud_<g><v>		**Global cloud flags**		**u16**	**rows columns**
flag_masks		Masks for each flag bit	See Table 3-3		1
flag_meanings		Text descriptions for each flag bit	See Table 3-3		1
bayes_<g><v>		**Bayesian cloud flags**		**u8**	**rows columns**
flag_masks		Masks for each flag bit	See Table 3-4		1
flag_meanings		Text descriptions for each flag bit	See Table 3-4		1
pointing_<g><v>		**Global pointing flags**		**u8**	**rows columns**
flag_masks		Masks for each flag bit	See Table 3-5		1
flag_meanings		Text descriptions for each flag bit	See Table 3-5		1
confidence_<g><v>		**Global confidence flags**		**u16**	**rows columns**

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Element name	Description	Range or value	T	D
flag_masks	Masks for each flag bit	See Table 3-6		1
flag_meanings	Text descriptions for each flag bit	See Table 3-6		1
cloud_orphan_\<g>\<v>	**Orphan pixel global cloud flags**		**u16**	**rows orphan_pixels**
flag_masks	Masks for each flag bit	See Table 3-3		1
flag_meanings	Text descriptions for each flag bit	See Table 3-3		1
bayes_orphan_\<g>\<v>	**Orphan pixel Bayesian cloud flags**		**u8**	**rows orphan_pixels**
flag_masks	Masks for each flag bit	See Table 3-4		1
flag_meanings	Text descriptions for each flag bit	See Table 3-4		1
pointing_orphan_\<g>\<v>	**Orphan pixel global pointing flags**		**u8**	**rows orphan_pixels**
flag_masks	Masks for each flag bit	See Table 3-5		1
flag_meanings	Text descriptions for each flag bit	See Table 3-5		1
confidence_orphan_\<g>\<v>	**Orphan pixel global confidence flags**		**u16**	**rows orphan_pixels**
flag_masks	Masks for each flag bit	See Table 3-6		1
flag_meanings	Text descriptions for each flag bit	See Table 3-6		1

Table 3-2: Global flags data file description

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Bit	Text code	Meaning if set	Comment
0		Visible channels cloud test	Day time only
1		1.37μm threshold test	Day time only
2		1.6μm small-scale histogram test	Day time only
3		1.6μm large-scale histogram test	Day time only
4		2.25μm small-scale histogram test	Day time only
5		2.25μm large-scale histogram test	Day time only
6		11μm spatial coherence test	
7		12μm gross cloud test	
8	thin_cirrus	11μm/12μm thin cirrus test	
9		3.7μm/12μm medium/high level test	
10	fog_low_stratus	11μm/3.7μm fog/low stratus test	
11		11μm/12μm view difference test	Uses both views
12		3.7μm/11μm view difference test	Uses both views
13	thermal_histogram	11μm/12μm thermal histogram test	
14		spare	
15		spare	

Table 3-3: Cloud word definitions

Bit	Text code	Meaning if set	Comment
0		Single view low probability threshold	Climate-quality clearing
1		Single view moderate probability threshold	Operational-quality clearing
2		Dual view low probability threshold	Climate-quality clearing
3		Dual view moderate probability threshold	Operational-quality clearing
4		spare	
5		spare	
6		spare	
7		spare	

Table 3-4: Bayesian cloud word definitions

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Bit	Text code	Meaning if set	Comment
0	FlipMirrorAbsoluteError	flip mirror absolute error exceeds threshold	
1	FlipMirrorIntegratedError	flip mirror integrated error exceeds threshold	
2	FlipMirrorRMSError	flip mirror RMS error exceeds threshold	
3	ScanMirrorAbsoluteError	scan mirror absolute error exceeds threshold	
4	ScanMirrorIntegratedError	scan mirror integrated error exceeds threshold	
5	ScanMirrorRMSError	scan mirror RMS error exceeds threshold	
6	ScanTimeError	Scan time is inconsistent with scan count sequence	
7	Platform_Mode	platform mode	0 if nominal, else 1

Table 3-5: Pointing word definitions

Bit	Text code	Meaning if set	Comment
0	coastline	coastline in field of view	
1	ocean	ocean in field of view	
2	tidal	tidal zone in field of view	
3	land	land in field of view	
4	inland_water	inland water in field of view	
5	unfilled	unfilled pixel (1 if this pixel is never tested or filled)	
6		(spare)	
7		(spare)	
8	cosmetic	cosmetic fill pixel	
9	duplicate	Pixel has a duplicate	
10	day	pixel in daylight	
11	twilight	pixel in twilight	
12	sun_glint	sun glint in pixel	
13	snow	snow	
14	summary_cloud	summary cloud test	
15	summary_pointing	summary pointing	

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Table 3-6: Confidence word definitions

4.2.1.2   Scan, Pixel and Detector Annotation Data File

The scan, pixel and detector number description table contains arrays of indices which map both gridded and orphaned pixels to their original positions in the instrument measurement frame. There are at most eight scan, pixel and detector number datasets, two at 1km resolution (nadir and oblique views) and six at 500m resolution (nadir and oblique views, "A stripe" and "B stripe and TDI if selected). The format for each is identical but the array sizes and the values of some attributes differ, rows and columns could be different for A and B stripes, along track array size is dependent on the time interval defined in the Job Order.

Element name	Description	Range or value	T	D
rows	Along track grid size			
columns	Across track grid size			
orphan_pixels	Maximum number of un-regridded (orphaned) pixels on each image line			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
l0_scan_offset_<g><v>	Offset between scan index and corresponding ISP scan count		int	1
_FillValue	Value indicating missing data	-2147483648		1
scan_<g><v>	Pixel scan number		u16	rows columns
_FillValue	Value indicating missing data	$2^{16} - 1$		1
pixel_<g><v>	Gridded pixel number		u16	rows columns
_FillValue	Value indicating missing data	$2^{16} - 1$		1
detector_<g><v>	Gridded pixel detector number		u8	rows columns
_FillValue	Value indicating missing data	$2^{8} - 1$		1
scan_orphan_<g><v>	Pixel scan number for un-regridded pixels		u16	rows orphan_pixels
_FillValue	Value indicating missing data	$2^{16} - 1$		1

Element name	Description	Range or value	T	D
pixel_orphan_<g><v>	**Un-regridded pixel number**		**u16**	**rows orphan_pixels**
_FillValue	Value indicating missing data	$2^{16} - 1$		1
detector_orphan_<g><v>	**Un-regridded pixel detector number**		**u8**	**rows orphan_pixels**
_FillValue	Value indicating missing data	$2^{8} - 1$		1

Table 3-7: Scan, Pixel and Detector Annotation data file description

4.2.1.3 Full Resolution Cartesian Coordinates Annotation Data File

The Cartesian coordinates dataset contains the ortho-geolocated quasi-Cartesian coordinates x and y of the centre of each pixel in the field of view on the earth's surface, determined from a digital elevation model, where x is the across track distance on the ellipsoid, locally perpendicular to the sub-satellite track and y is the distance along the sub-satellite track.

Important note: By construction, the y coordinate has its origin set at the ANX point. When a PDU is generated from two IPF granules (P1 and P2) each using a different ANX points, a discontinuity occurs when crossing the ANX. To overcome this issue, the discontinuity is removed by the PDU generation processor (PUG-F) by applying the following algorithm:

1. Make the average of the Y-Coordinates of the last row of the granule P1 (Yavg1)
2. Make the average of the Y-Coordinates of the first row of the granule P2 (Yavg2)
3. Compute the offset "delta=(Yavg1-Yavg2)+DX"
4. Compute the Y-coordinates of the merged product in this way:
   - For each pixel included in a row from product P1, maintain the Y-coordinates present in the input P1 product
   - whereas for each pixel from product P2, sum "delta" to the Y-Coordinates associated with this pixel.

The dataset is generated in the image frame. The dataset is encoded in NetCDF 4. There are at most eight datasets, two at 1km resolution (nadir and oblique views) and six at 500m resolution (nadir and oblique views, "A stripe" and "B stripe" and TDI if selected). The format of each of them is identical but the array sizes and the values of some attributes differ, along track array size is dependent on the time interval defined in the Job Order.

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Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**			
orphan_pixels	**Maximum number of un-regridded (orphaned) pixels on each image line**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
x_<g><v>	**Geolocated x (across track) coordinate of detector FOV centre**	**[-500000, +1000000]**	**i32**	**rows columns**
standard_name	CF standard name			1
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-1000000		1
y_<g><v>	**Geolocated y (along track) coordinate of detector FOV centre**	**[-1000000, +50000000]**	**i32**	**rows columns**
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-50000000		1
x_orphan_<g><v>	**Geolocated x (across track) coordinate of detector FOV centre for un-regridded pixels**	**[-500000, +1000000]**	**i32**	**rows orphan_pixels**
standard_name	CF standard name			1
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-1000000		1
y_orphan_<g><v>	**Geolocated y (along track) coordinate of detector FOV centre for un-regridded pixels**	**[-1000000, +50000000]**	**i32**	**rows orphan_pixels**

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Element name	Description	Range or value	T	D
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-50000000		1

Table 3-8: Full Resolution Cartesian Coordinates Annotation data file description

4.2.1.4   Tie points Cartesian Coordinates Annotation Data File

The Tie Points Cartesian coordinates dataset contains the quasi-Cartesian swath coordinates of the tie-points on the ellipsoid (the resolution is 1 km in the along-track direction and 16 km in the across-track one).

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
x_<g><v>	**Geolocated x (across track) coordinate of detector FOV centre**		f64	**rows columns**
units	UDUNITS unit name	m		1
y_<g><v>	**Geolocated y (along track) coordinate of detector FOV centre**		f64	**rows columns**
units	UDUNITS unit name	m		1

Table 3-9: Tie Points Cartesian Coordinates Annotation data file description

4.2.1.5   Full Resolution Geodetic Coordinates Annotation Data File

The geodetic coordinates' dataset contains the ortho-geolocated geodetic coordinates, in latitude and longitude, and the surface elevation of the centre of each pixel in the field of view on the earth's surface, determined from a digital elevation model. The dataset is generated in the image frame. The dataset is encoded in NetCDF 4. There are at most eight datasets, two at 1km resolution (nadir and oblique views) and six at 500m

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resolution (nadir and oblique views, "A stripe" and "B stripe" and TDI if selected). The format of each of them is identical but the array sizes and the values of some attributes differ, along track array size is dependent on the time interval defined in the Job Order.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**			
orphan_pixels	**Maximum number of un-regridded (orphaned) pixels on each image line**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
latitude_<g><v>	**Latitude of detector FOV centre on the earth's surface**	**[-90; 90]**	**i32**	**rows columns**
standard_name	CF standard name	latitude		1
units	UDUNITS unit name	degrees_north		1
scale_factor	Scaling factor used in decoding packed data	1e-6		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-2147483648		1
longitude_<g><v>	**Longitude of detector FOV centre on the earth's surface**	**[-180; 180]**	**i32**	**rows columns**
standard_name	CF standard name	longitude		1
units	UDUNITS unit name	degrees_east		1
scale_factor	Scaling factor used in decoding packed data	1e-6		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-2147483648		1
elevation_<g><v>	**Surface elevation of detector FOV centre above reference ellipsoid**	**[-450; 9000]**	**i16**	**rows columns**
standard_name	CF standard name	surface_altitude		1
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.1		1

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Element name	Description	Range or value	T	D
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-32768		1
latitude_orphan_<g><v>	**Latitude of detector FOV centre on the earth's surface associated with un-regridded pixels**	**[-90; 90]**	**i32**	**rows orphan_pixels**
standard_name	CF standard name	latitude		1
units	UDUNITS unit name	degrees_north		1
scale_factor	Scaling factor used in decoding packed data	1e-6		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-2147483648		1
longitude_orphan_<g><v>	**Longitude of detector FOV centre on the earth's surface associated with un-regridded pixels**	**[-180; 180]**	**i32**	**rows orphan_pixels**
standard_name	CF standard name	longitude		1
units	UDUNITS unit name	degrees_east		1
scale_factor	Scaling factor used in decoding packed data	1e-6		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-2147483648		1
elevation_orphan_<g><v>	**Surface elevation of detector FOV centre above reference ellipsoid associated with un-regridded pixels**	**[-450; 9000]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	surface_altitude		1
units	UDUNITS unit name	m		1
scale_factor	Scaling factor used in decoding packed data	0.1		1
add_offset	Offset used to in decoding packed data	0		1
_FillValue	Value indicating missing data	-32768		1

Table 3-10: Full Resolution Geodetic Coordinates Annotation data file description

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4.2.1.6   Tie points Geodetic Coordinates Annotation Data Files

The Tie Points geodetic coordinates dataset contains the geodetic coordinates, in latitude and longitude, of the tie-points on the ellipsoid. The resolution of this grid is 1 km on the along-track direction and 16 km on the across-track one.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
latitude_<g><v>	**Latitude of detector FOV centre on the earth's surface**	**[-90; 90]**	**f64**	**rows columns**
standard_name	CF standard name	"latitude"		1
units	UDUNITS unit name	"degrees_north"		1
longitude_<g><v>	**Longitude of detector FOV centre on the earth's surface**	**[-180; 180]**	**f64**	**rows columns**
standard_name	CF standard name	"longitude"		1
units	UDUNITS unit name	"degrees_east"		1

Table 3-11: Tie points Geodetic Coordinates Annotation data file description

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4.2.1.7   Time Annotations Data File

The time coordinate dataset contains the measurement times for each image line. The main time information is the scan acquisition time associated with the sub-satellite point included on each line. Others parameters are included to be bale to retrieve the exact acquition time of each instrument pixel. The dataset is encoded in NetCDF 4. There are at most four datasets, one at 1km resolution (common for nadir and oblique views) and three at 500m resolution (common for nadir and oblique views, "A stripe" and "B stripe" and TDI if selected). The format of each of them is identical but the array sizes and the values of some attributes differ along track array size is dependent on the time interval defined in the Job Order.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
time_stamp_<g>	**Acquisition time of the sub-satellite point included in this line**		**i64**	**rows**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"microseconds since 2000-01-01T00:00:00Z"		1
_FillValue	Default value for scan_time entry	$-(2^{63})$		1
SCANSYNC	**Scan Period defined as a complete rotation of the scan mirrors.**		**i32**	**1**
units	UDUNITS unit name	us		1
PIXSYNC_<g>	**Frequency at which the pixels are sampled on each scan**		**i32**	**1**
units	UDUNITS unit name	us		1
Nadir_First_scan_<g><v>	**Scan number of the first Nadir scan contributing to each line**	**[0; 32766]**	**u16**	**rows**
_FillValue	Value indicating missing data	$2^{16} - 1$		1
Nadir_Last_scan_<g><v>	**Scan number of the last Nadir scan contributing to each line**	**[0; 32766]**	**u16**	**rows**
_FillValue	Value indicating missing data	$2^{16} - 1$		1
Oblique_First_scan_<g><v>	**Scan number of the first oblique scan contributing to each line**	**[0; 32766]**	**u16**	**rows**
_FillValue	Value indicating missing data	$2^{16} - 1$		1
Oblique_Last_scan_<g><v>	**Scan number of the last Oblique scan contributing to each line**	**[0; 32766]**	**u16**	**rows**
_FillValue	Value indicating missing data	$2^{16} - 1$		1

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Element name	Description	Range or value	T	D
Nadir_Minimal_ts_<g><v>	**Acquisition time of the first nadir scan contributing to each line**		**i64**	**rows**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"microseconds since 2000-01-01T00:00:00Z"		1
_FillValue	Default value for scan_time entry	$-(2^{63})$		1
Nadir_Maximal_ts_<g><v>	**Acquisition time of the last nadir scan contributing to each line**		**i64**	**rows**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"microseconds since 2000-01-01T00:00:00Z"		1
_FillValue	Default value for scan_time entry	$-(2^{63})$		1
Oblique_Minimal_ts_<g><v>	**Acquisition time of the first oblique scan contributing to each line**		**i64**	**rows**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"microseconds since 2000-01-01T00:00:00Z"		1
_FillValue	Default value for scan_time entry	$-(2^{63})$		1
Oblique_Maximal_ts_<g><v>	**Acquisition time of the last oblique scan contributing to each line**		**i64**	**rows**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"microseconds since 2000-01-01T00:00:00Z"		1
_FillValue	Default value for scan_time entry	$-(2^{63})$		1

Table 3-12: Time Annotation data file description

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4.2.1.8 Solar and Satellite Geometry Annotation Data File

The Solar and Satellite Geometry Annotation Data Files contain the solar and satellite azimuth and zenith angles at earth's surface and the corresponding distances to the surface, on a tie point grid. The resolution of this grid is 1 km on along-track direction and 16 km on across-track one. There are two data sets, one for the nadir and one for the oblique viewing geometries. The format of;each of them is identical and it is reported in the following table.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**			
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
solar_zenith_<g><v>	**Solar zenith angle**		**f32**	**rows columns**
standard_name	CF standard name	"solar_zenith_ angle"		1
units	UDUNITS unit name	"degrees"		1
solar_azimuth_<g><v>	**Solar azimuth angle**		**f32**	**rows columns**
standard_name	CF standard name	"solar_azimuth_angle"		1
units	UDUNITS unit name	"degrees"		1
solar_path_<g><v>	**Distance from sun to surface**		**f32**	**rows columns**
units	UDUNITS unit name	"m"		1
sat_zenith_<g><v>	**Satellite zenith angle**		**f32**	**rows columns**
standard_name	CF standard name	"solar_zenith_ angle"		1
units	UDUNITS unit name	"degrees"		1
sat_azimuth_<g><v>	**Satellite azimuth angle**		**f32**	**rows columns**
standard_name	CF standard name	"solar_azimuth_angle"		1
units	UDUNITS unit name	"degrees"		1

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Element name	Description	Range or value	T	D
sat_path_<g><v>	**Distance from satellite to surface**		**f32**	**rows columns**
units	UDUNITS unit name	"m"		1

Table 3-13: Solar and Satellite Geometry Annotation data file description

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4.2.1.9   Meteorological Parameters Annotation Data File

The meteorological parameters data file contains ECMWF forecast or analysis fields, regridded onto tie points. The resolution of this grid is 1 km on along-track direction and 16 km on across-track one. The dataset contains three types of field:

- single surface or near-surface values
- surface time series
- profiles

By default, the synoptic time is the time nearest to the product centre time. For near-real time products, ECMWF forecast input fields must be updated continuously, to ensure that the data in the meteorology auxiliary dataset is valid for the L1b product. For these, the analysis time is the nearest available time preceeding the synoptic time.

Field t_forecast_tx is the time of the analysis file used to produce the forecast. It is not applicable when input product is an analysis. In this case, the field will be empty.

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Element name	Description	Range or value	T	D
rows	**Tie-point grid along-track array size**			
columns	**Tie-point grid across-track array size**			
n_bound	**Start/stop bounds for integrated products**	**2**		
t_single	**Synoptic time of single time fields**	**1**		
t_series	**Synoptic times of time series fields**	**5**		
z_wind	**Wind field height coordinate**	**1**		
z_atmos	**Atmospheric field height coordinate**	**1**		
z_soil	**Soil depth coordinate**	**1**		
p_atmos	**Pressure levels of profile fields**	**25**		
<common global attributes>	Common global attributes (see [AD- 3] and 3.1.3.1)			
t_forecast_tx	**For forecast parameters, the time of the analysis from which the forecast was made**		**i16**	
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"hours since…"		1
t_single	**Synoptic time of single time fields**		**i16**	**t_single**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"hours since…"		1
axis	Coordinate axis identifier	"T"		1
t_series	**Synoptic times of time series fields**		**i16**	**t_series**
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"hours since…"		1
axis	Coordinate axis identifier	"T"		1
bounds	Reference to "t_bound"	"t_bound"		1
t_bound	**Start and stop times for integrated products**		**i16**	**t_series n_bound**
standard_name	CF standard name	"time"		1

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Element name	Description	Range or value	T	D
units	UDUNITS unit name	"hours since…"		1
axis	Coordinate axis identifier	"T"		1
z_wind	**Height of wind field above surface**		**i16**	**z_wind**
standard_name	CF standard name	"height"		1
units	UDUNITS unit name	"metre"		1
axis	Coordinate axis identifier	"Z"		1
positive	axis orientation	"up"		1
z_atmos	**Height of atmospheric field above surface**		**i16**	**z_atmos**
standard_name	CF standard name	"height"		1
units	UDUNITS unit name	"metre"		1
axis	Coordinate axis identifier	"Z"		1
positive	axis orientation	"up"		1
z_soil	**Depth of soil wetness level**		**f32**	**z_soil**
standard_name	CF standard name	"height"		1
units	UDUNITS unit name	"metre"		1
axis	Coordinate axis identifier	"Z"		1
positive	axis orientation	"down"		1
bounds	Reference to "z_bound"	"z_bound"		1
z_bound	**Soil wetness level depth bounds**		**i16**	**z_soil n_bound**
standard_name	CF standard name	"height"		1
units	UDUNITS unit name	"metre"		1
axis	Coordinate axis identifier	"Z"		1
positive	axis orientation	"down"		1
p_atmos	**Pressure level coordinates**		**i16**	**p_atmos**
standard_name	CF standard name	"air_pressure"		1

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Element name	Description	Range or value	T	D
units	UDUNITS unit name	"Pa"		1
axis	Coordinate axis identifier	"Z"		1
sea_surface_temperature_tx	**Sea surface temperature**		**f32**	**t_single** **rows** **columns**
standard_name	CF standard name	"sea_surface_temperature"		1
units	UDUNITS unit name	"K"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"34"		1
sea_ice_fraction_tx	**Sea ice fraction**		**f32**	**t_single** **rows** **columns**
standard_name	CF standard name	"sea_ice_area_fraction"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"31"		1
u_wind_tx	**10m U wind component**		**f32**	**t_series** **z_wind** **rows** **columns**
standard_name	CF standard name	"eastward_wind"		1
units	UDUNITS unit name	"m s^{-2}"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"165"		1
v_wind_tx	**10m V wind component**		**f32**	**t_series** **z_wind** **rows** **columns**
standard_name	CF standard name	"northward_wind"		1
units	UDUNITS unit name	"m s^{-2}"		1

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Element name	Description	Range or value	T	D
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"166"		1
sensible_heat_tx	**Integrated surface sensible heat flux**		**f32**	**t_series rows columns**
standard_name	CF standard name	"integral_of_ surface_ downward_ sensible_heat_ flux_wrt_time"		1
units	UDUNITS unit name	"W m-2 s"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"146"		1
latent_heat_tx	**Integrated surface latent heat flux**		**f32**	**t_series rows columns**
standard_name	CF standard name	"integral_of_ surface_ downward_ latent_heat_ flux_wrt_time"		1
units	UDUNITS unit name	"W m-2 s"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"147"		1
solar_radiation_tx	**Integrated surface solar radiation**		**f32**	**t_series rows columns**
standard_name	CF standard name	"integral_of_ surface_ net_downward_ shortwave_ flux_wrt_time"		1
units	UDUNITS unit name	"W m-2 s"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"176"		1

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Element name	Description	Range or value	T	D
thermal_radiation_tx	**Integrated surface thermal radiation**		**f32**	**t_series** **rows** **columns**
standard_name	CF standard name	"integral_of_ surface_ net_downward_ longwave_ flux_wrt_time"		1
units	UDUNITS unit name	"W m-2 s"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"177"		1
temperature_profile_tx	**Atmospheric temperature profile**		**f32**	**t_single** **p_atmos** **rows** **columns**
standard_name	CF standard name	"air_temperature"		1
units	UDUNITS unit name	"K"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"130"		1
specific_humidity_tx	**Specific humidity profile (kg/kg)**		**f32**	**t_single** **p_atmos** **rows** **columns**
standard_name	CF standard name	"specific_ humidity"		1
units	UDUNITS unit name	"kg/kg"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"133"		1
total_column_water_vapour_tx	**Total column water vapour**		**f32**	**t_single** **rows** **columns**
standard_name	CF standard name	"atmosphere_ water_vapor_ content"		1

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Element name	Description	Range or value	T	D
units	UDUNITS unit name	"kg m-2"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"137"		1
total_column_ozone_tx	**Total column Ozone**		**f32**	**t_single rows columns**
standard_name	CF standard name	"atmospheric_mass_content_of_ ozone"		1
units	UDUNITS unit name	"kg m-2"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"202"		1
snow_albedo_tx	**Snow Albedo**		**f32**	**t_single rows columns**
standard_name	CF standard name	"snow_albedo"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	TBC		1
surface_pressure_tx	**Surface pressure**		**f32**	**t_single rows columns**
standard_name	CF standard name	"surface_air_ pressure"		1
units	UDUNITS unit name	"hPa"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"134"		1
east_west_stress_tx	**East-west integrated surface wind stress**		**f32**	**t_series rows columns**

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Element name	Description	Range or value	T	D
standard_name	CF standard name	"integral_of_ surface_ downward_ eastward_ stress_wrt_ time"		1
units	UDUNITS unit name	"N m-2 s"		1
model	Model identifier (e.g. interim era analysis)	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"180"		1
north_south_stress_tx	**North-south integrated surface wind stress**		**f32**	**t_series rows columns**
standard_name	CF standard name	"integral_of_ surface_ downward_ northward_ stress_wrt_ time"		1
units	UDUNITS unit name	"N m-2 s"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"181"		1
cloud_fraction_tx	**Fractional cloud cover**		**f32**	**t_single rows columns**
standard_name	CF standard name	"cloud_area_fraction"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"164"		1
soil_wetness_tx	**Soil wetness (level 1)**		**f32**	**t_single rows columns**
standard_name	CF standard name	"moisture_content_of _soil_layer"		1
units	UDUNITS unit name	"m"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"140"		1

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Element name	Description	Range or value	T	D
temperature_tx	**2m air temperature**		**f32**	**t_single z_atmos rows columns**
standard_name	CF standard name	"air_temperature"		1
units	UDUNITS unit name	"K"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"167"		1
dew_point_tx	**2m dew point**		**f32**	**t_single z_atmos rows columns**
standard_name	CF standard name	"dew_point_ temperature"		1
units	UDUNITS unit name	"K"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"168"		1
skin_temperature_tx	**Skin temperature**		**f32**	**t_single rows columns**
standard_name	CF standard name	"surface_ temperature"		1
units	UDUNITS unit name	"K"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"235"		1
snow_depth_tx	**Snow liquid water equivalent depth**		**f32**	**t_single rows columns**
standard_name	CF standard name	"lwe_thickness_of_su rface_ snow_amount"		1
units	UDUNITS unit name	"metre"		1

Element name	Description	Range or value	T	D
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"141"		1

Table 3-14: Meteorological Annotation data file description

Note 1: The model attribute should contain a code to identify the source (e.g. ECWMF) and type (forecast or analysis) of the met field. For ECMWF fields, it is recommended that these codes should be "ECMWF_F" or "ECMWF_A".

5.   MANIFEST FILE DESCRIPTION: COMMON PART

The purpose of this section is to describe in detail all the data sets that are included with any of the Sentinel-3 SLSTR product. Most of the description are common to all products and are therefore described in [AD-3].

Only the common parts are detailed in this section.

5.1   Metadata Section

See AD-3 for the metadata general description.

5.2   Data Object Section

The data object section of the manifest includes one data object per data object pointer. Each data object pointer is identified with its dataObjectID as defined in the dedicated information package map.

5.2.1   Common annotation Data Files

Each common annotations Data File constitutes a Data Object composed as follows:

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_FLAGS_xx_Data', where xx=AN, AO, BN, BO, CN, CO, IN, IO
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"

Name				Description	Data type	Occ.	Value
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"flags_xx.nc", xx = an, ao, bn, bo, cn, co, in, io
			textInfo	Textual description of the Data Component	S	0..1	"Global Flags Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-1: Global Flags Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_INDICES_xx_Data', where xx=AN, AO, BN, BO, CN, CO, IN, IO
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"indices_xx.nc", xx = an, ao, bn, bo, cn, co, in, io
			textInfo	Textual description of the Data Component	S	0..1	"Scan, Pixel and Detector Number Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-2: Scan, Pixel and Detector Number Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_CARTESIAN_xx_Data', where xx=AN, AO, BN, BO, CN, CO, IN, IO, TX
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"cartesian_xx.nc", xx = an, ao, bn, bo, cn, co, in, io, tx
			textInfo	Textual description of the Data Component	S	0..1	"Full and TP Resolution Cartesian Coordinates Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-3: Full and Tie point Resolution Cartesian Coordinates Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_GEODETIC_xx_Data', where xx=AN, AO, BN, BO, CN, CO, IN, IO, TX
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"geodetic_xx.nc", xx = an, ao, bn, bo, cn, co, in, io, tx
			textInfo	Textual description of the Data Component	S	0..1	"Full and TP Resolution Geodetic Coordinates Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-4: Full and Tie point Resolution Geodetic Coordinates Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_TIME_xx_Data', where xx=AN, BN, CN, IN,
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"time_xx.nc",; xx = an, bn, cn, in
			textInfo	Textual description of the Data Component	S	0..1	"Time Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-5: Time Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_GEOMETRY_xx_Data', where xx=TN, TO
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"geometry_xx.nc",; xx = tn, to
			textInfo	Textual description of the Data Component	S	0..1	"Solar and Satellite Geometry Annotation Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-6: Solar and Satellite Geometry Annotation Data Object

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'SLSTR_MET_TX_Data'
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"met_tx.nc"
			textInfo	Textual description of the Data Component	S	0..1	"Meteorological Parameters Auxiliary Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-7: Meteorological Parameters Auxiliary Data Object

Data Object				This element references the OLQC Report associated to the L0 product.	U	1..*	
	ID			Data Component;ID	S	1	"OLQCReport"
	byte Stream			Pointer to the Data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/octetstream"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		TBD
			textInfo	Textual description of the Data Component	S	0..1	"On Line Quality Control Report"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 4-8: OLQC Annotation Metadata Object

6. XML SCHEMA

The xml schemas used to generate the product manifest are provided as separate files (see AD- 5).

7.   SLSTR PRODUCT FORMAT SPECIFICATION

7.1   Earth Observation Products

7.1.1 Level 2 Product: SL_2_LST___

This product contains the Land Surface parameters.

7.1.1.1   Package Description

A "SL_2_LST___" Level 2 product is composed of one measurements data file.

In the following sections the content of this file is reported.

7.1.1.1.1   SL_2_LST___ product summary

Product Package Type **SL_2_LST___**		*Description* Land Surface Parameters			
Product Level	**Diss. Timeliness**	**Product Category**	**Application Domain**	**Spatial Resolution**	
2	NRT NTC	Available to the user	LND	1Km	
Product Dissemination Unit Stripe		Number of Package components	Number of Measurement Data Files	Number of Annotation Data Files	Number of Representation Information Files
		13[1]	1	10	0
Product Package Structure					
Manifest file (see [AD-8] and section 7.1.1.2 and 8 for more details)					
File name		**Composition**			
xfdumanifest.xml		XML fields			
Measurement Data files (see section 7.1.1.4 for more details)					
File name		**Composition**			**N.O.**
LST_in.nc		LST, LST_uncertainty, LST_orphan, LST_uncertainty_orphan, exception, exception_orphan			
Annotation Data files (see [AD-8] and section 7.1.1.5 for more details)					
File name		**Composition**			**N.O.**
LST_ancillary_ds.nc		NDVI, NDVI_orphan, biome, biome_orphan, fraction, fraction_orphan, TCWV, validation			
flags_in.nc		cloud_in, bayes_in, pointing_in, confidence_in, cloud_orphan_in, bayes_orphan_in, pointing_orphan_in, confidence_orphan_in			
indices_in.nc		scan_in, pixel_in, detector_in, scan_orphan_in, pixel_orphan_in, detector_orphan_in			
time_in.nc		time_stamp_i, first_scan_in, first_scan_io, […]			
geodetic_in.nc		latitude_in, longitude_in, elevation_in, latitude_orphan_in, longitude_orphan_in, elevation_orphan_in			
cartesian_in.nc		x_in, y_in, x_orphan_in, y_orphan_in			
geometry_tn.nc		solar_zenith_tn, solar_azimuth_tn, solar_path_tn, sat_zenith_tn, sat_azimuth_tn, sat_path_tn			
geodetic_tx.nc		latitude_tx, longitude_tx			

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[1] *Number of Package components includes the manifest and the OLQC Report.*

`cartesian_tx.nc`	x_tx, y_tx	
`met_tx.nc`	t_forecast, t_single, t_series, t_bound, z_wind, z_atmos, z_soil, z_bound, p_atmos, SST, sea_ice_fraction	
Representation Information Files		
File name	**Composition**	
`none`		

Table 7-1: SLSTR LST Level 2 product physical composition

7.1.1.2   Manifest File

The structure of the Manifest element is described in [AD- 3].

7.1.1.3   Wrapped Metadata

According to [AD- 3], Wrapped Metadata are grouped in Primary Metadata, common to all Sentinel 3 products and Secondary Metadata, specific for instrument and processing level.

Primary Metadata are described in [AD- 3].

Secondary Metadata for the SLSTR instrument are reported in **Table 7-2**. Last columns of the table indicate the applicability of Metadata fields to the processing Level.

< Complete secondary metadata is described in details in [AD- 4].
The content of this table will be embedded in the document when it will be finalized>

Table 7-2: **Secondary Metadata for SLSTR products**

7.1.1.4   Measurement Data Files

7.1.1.4.1   SLSTR Level 2 Land Surface Temperature

The land surface temperature (LST) dataset contains LST, LST uncertainty and other supporting fields. It is generated on the wide 1km measurement grid.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**	**1490**		
orphan_pixels	**Maximum number of un-regridded (orphaned) pixels per image line**			
<common global attributes>	Common global attributes (see [AD- 3] and [AD-8])			
LST	**Gridded Land Surface Temperature**	**[-32768, 32768]**	**i16**	**rows columns**
standard_name	CF standard name	surface_temperature		1
units	UDUNITS unit name	K		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	2e-03		1
add_offset	Offset used to in decoding packed data	290.0		1
LST_uncertainty	**Gridded LST estimated total uncertainty**	**[0, 4000]**	**i16**	**rows columns**
standard_name	CF standard name	surface_temperature_standard_error		1
units	UDUNITS unit name	K		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	2e-03		1
add_offset	Offset used to in decoding packed data	0.0		1
exception	**Gridded LST pixel exception flags**		**I16**	**rows columns**

Element name	Description	Range or value	T	D
standard_name	CF standard name	surface_temperature_status_flag		1
flag_masks	Flag masks	**See Table 7-4**		1
flag_meanings	Flag descriptions	**See Table 7-4**		1
LST_orphan	**Ungridded Land Surface Temperature**	**[-32768, 32768]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	surface_temperature		1
units	UDUNITS unit name	K		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	2e-03		1
add_offset	Offset used to in decoding packed data	290		1
LST_uncertainty_orphan	**Ungridded LST estimated total uncertainty**	**[0, 4000]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	surface_temperature_standard_error		1
units	UDUNITS unit name	K		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	2e-03		1
add_offset	Offset used to in decoding packed data	0.0		1
exception_orphan	**Ungridded LST pixel exception flags**		**i16**	**rows orphan_pixels**
standard_name	CF standard name	surface_temperature_status_flag		1
flag_masks	Flag masks	**See Table 7-4**		1
flag_meanings	Flag descriptions	**See Table 7-4**		1

Table 7-3: SL_2_LST__ LST_in description

Bit number	Text Code	Description
0	ISP_absent	ISP absent
1	pixel_absent	Pixel absent
2	not_decompressed	Not decompressed
3	no_signal	No signal in channel
4	saturation	Saturation in channel
5	invalid_radiance	Derived radiance outside calibration
6	no_parameters	Calibration parameters unavailable
7	unfilled_pixel	Unfilled pixel
8	LST_underflow	LST underflow
9	LST_overflow	LST overflow
10	biome	LST could not be calculated for this biome type
11:15		(spare)

Table 7-4: LST exception flags

7.1.1.4.2   SLSTR Level 2 Fire Radiative Power

This section has been deleted as the FRP product is now developed as an independent SLSTR L2 product in the frame of the New Product Activity.

7.1.1.5   Specific annotation Data Files

In this section, the specific annotations included in the Level 2 LST product are described. The other annotations files (common to Level 1 and Level 2 products) are described in [AD-8].

7.1.1.5.1   SLSTR Level 2 LST ancillary Data Files

This annotation data file contains variables that are considered as ancillary datasets for supporting the interpretation of the Land Surface temperature geophyscial variable.

Element name	Description	Range or value	T	D
rows	**Along track grid size**			
columns	**Across track grid size**	**1490**		
nval	**Number of validation status flags**			
<common global attributes>	Common global attributes (see [AD- 3] and [AD-8])			
NDVI	**Gridded Normalised Difference Vegetation Index**	**[-25000, 25000]**	**i16**	**rows columns**
standard_name	CF standard name	normalized_difference_vegetation_index		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	5e-05		1
add_offset	Offset used to in decoding packed data	0.0		1
biome	**Gridded GlobCover surface classification code**		**u8**	**rows columns**
flag_values	Flag values	SeeTable 7-6		1
flag_meanings	Flag descriptions	See Table 7-6		1
fraction	**Gridded fractional vegetation cover**	**[-25000, 25000]**	**i16**	**rows columns**
standard_name	CF standard name	vegetation_area_fraction		1
_FillValue	Value indicating missing data	-32768		1

Element name	Description	Range or value	T	D
scale_factor	Scaling factor used in decoding packed data	1e-05		1
add_offset	Offset used to in decoding packed data	0.5		1
TCWV	**Gridded Total Column Water Vapour**	**[-30000, 32767]**	**i16**	**rows columns**
standard_name	CF standard name	atmosphere_mass_content_of_water_vapor		1
units	UDUNITS unit name	kg m-2		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	1e-03		1
add_offset	Offset used to in decoding packed data	30		1
NDVI_orphan	**Ungridded Normalised Difference Vegetation Index**	**[-25000, 25000]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	normalized_difference_vegetation_index		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	5e-05		1
add_offset	Offset used to in decoding packed data	0.0		1
biome_orphan	**Ungridded GlobCover surface classification code**		**u8**	**rows orphan_pixels**
flag_values	Flag values	See Table 7-6		1
flag_meanings	Flag descriptions	See Table 7-6		1
fraction_orphan	**Ungridded fractional vegetation cover**	**[-25000, 25000]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	vegetation_area_fraction		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	1e-05		1
add_offset	Offset used to in decoding packed data	0.5		1

Element name	Description	Range or value	T	D
TCWV_orphan	**Ungridded fractional vegetation cover**	**[-30000, 32767]**	**i16**	**rows orphan_pixels**
standard_name	CF standard name	atmosphere_mass_content_of_water_vapor		1
units	UDUNITS unit name	kg m-2		1
_FillValue	Value indicating missing data	-32768		1
scale_factor	Scaling factor used in decoding packed data	1e-03		1
add_offset	Offset used to in decoding packed data	30		1
validation	**LST validation status for biome class**		**i8**	**nval**
flag_masks	Flag masks	**See Table 7-7**		1
flag_meanings	Flag descriptions	**See Table 7-7**		1

Table 7-5: SL_2_LST__ LST ancillary data file description

Numeric Code	Text Code	GlobCover legend
0	open_ocean	Open ocean
11	irrigated_cropland	Post-flooding or irrigated croplands
14	rainfed_cropland	Rainfed croplands
20	mosaic_cropland	Mosaic Cropland (50-70%) / Vegetation (grassland, shrubland, forest) (20-50%)
30	mosaic_vegetation	Mosaic Vegetation (grassland, shrubland, forest) (50-70%) / Cropland (20-50%)
40	broadleaved_evergreen_forest	Closed to open (>15%) broadleaved evergreen and/or semi-deciduous forest (>5m)
50	closed_broadleaved_deciduous_forrest	Closed (>40%) broadleaved deciduous forest (>5m)
60	open_broadleaved_deciduous_forest	Open (15-40%) broadleaved deciduous forest (>5m)
70	closed_needleleaved_forest	Closed (>40%) needleleaved evergreen forest (>5m)
90	open_needleleaved_forest	Open (15-40%) needleleaved deciduous or evergreen forest (>5m)
100	mixed_forest	Closed to open (>15%) mixed broadleaved and needleleaved forest (>5m)
110	mosaic_forest	Mosaic Forest/Shrubland (50-70%) / Grassland (20-50%)
120	mosaic_grassland	Mosaic Grassland (50-70%) / Forest/Shrubland (20-50%)
130	shrubland	Closed to open (>15%) shrubland (<5m)
140	grassland	Closed to open (>15%) grassland
150	sparse_vegetation	Sparse (>15%) vegetation (woody vegetation, shrubs, grassland)
160	freshwater_flooded_forest	Closed (>40%) broadleaved forest regularly flooded – Fresh water
170	saltwater_flooded_forest	Closed (>40%) broadleaved semi-deciduous and/or evergreen forest regularly flooded – Saline water
180	flooded_vegetation	Closed to open (>15%) vegetation (grassland, shrubland, woody vegetation) on regularly flooded or waterlogged soil – Fresh, brackish or saline water
190	artificial_surface	Artificial surfaces and associated areas (urban areas >50%)
200	bare_area	Bare areas
210	water	Inland water bodies and coastal water
220	snow_and_ice	Permanent snow and ice
230	no_data	No data (burnt areas, clouds, …)

Table 7-6 : LST surface classification codes (biome values)

Numeric code	Text Code	Description
-1	not_recognised	Biome class not recognised
0	not_validated	No validation information for this biome class
1	limited_validation	Limited validation information for this biome class
2	fully_validated	Fully validated biome class

Table 7-7: LST surface classification status

7.2   Browse Products

A browse product consists of a collection of metadata information gathered in the xfdumanifest files and of one or more browse images. The images can represent one or several parameters or combination of parameters stored in one or several image formats.

7.2.1   Manifest File

The structure of the Manifest element is described in [AD-3].

7.2.1.1 Wrapped Metadata

According to [AD- 3], Wrapped Metadata are grouped in Primary Metadata, common to all Sentinel 3 products.

Regarding the primary metadata: the fields are the same of the parent product, with different values for some fields (which are filled by the browse processor). There is no secondary metadata section for the browse products.

7.2.2   Level 2 Browse Package Description

7.2.2.1   'SL_2_LST_BW' L2 Measurement Data File

7.2.2.1.1   SL_2_LST_BW product summary

Product Package Type SL_2_LST_BW	Description SLSTR Browse L2 Product general structure

Product Level	Diss. Timeliness	Product Category		Application Domain		Spatial Resolution
2	(NRT) (NTC)	Not Available to the user				
Product Dissemination Unit N/A		Number of Package components	Number of Measurement Data Files	Number of Annotation Data Files		Number of Representation Information Files
		$\geq 3^2$	≥ 1	0		0
Product Package Structure						
Manifest file (see [AD-8] and section 7.2.1 for more details)						
File name			**Composition**			
xfdumanifest.xml			XML fields			
Measurement Data files (see section 7.2.2.3 for more details)						
File name			**Composition**			
`<scientificData>_BrwImage.<ext>`			Pseudo color image referred to the scientific data indicated into the component filename			
Annotation Data files						
File name			**Composition**			
none						
Representation Information Files						
File name			**Composition**			
none						

Table 7-8: SLSTR Browse L2 Product physical composition

7.2.2.2   Package Description

The SLSTR Level 2 Browse consists of multiple pseudo colour image.

7.2.2.3   Measurement Data File

The Browse products contain one or more images corresponding respectively to one or more scientific data. The full list of allowed parameters is provided in the processing control parameter file description, section 12.3.2.1 in AD- 6 ("scientific Fields" container, "Field" parameter). The number of fields to process is set through the 'count' attribute.

---

[2] *Number of Package components includes the manifest and the OLQC Report.*

The product may contain one or several browse images representing one or several parameters in the allowed image formats (see list of accepted formats in AD- 3 for the list)

8. MANIFEST FILE DESCRIPTION

The purpose of this section is to describe in detail all the data sets that are included with any of the Sentinel-3 SLSTR product. Most of the description are common to all products and are therefore described in [AD-3].

Only the IPF specific parts are detailed in this section.

8.1 InformationPackageMap

8.1.1 'SL_2_LST___' Level 2 Product

The Information Package Map associated to the package of the SL_2_LST product is reported in the next table.

Name				Description	Data Type	Value	Occ.
contentUnit				The information package map contains one content unit that includes the product data component included in the product.	Content Unit Type		1
	ID			Identifier of the package	S	"packageUnit"	0..1
	unitType			Describes the type of data referenced by this content unit	S	'Information Package'	0..1
	textInfo			Textual description of the content unit	S	'SENTINEL-3 SLSTR Level 2 Land Product'	0..1
	pdiID			Identifier of the Preservation Description;Information applicable to this content unit	S	'processing'	1
	dmdID			Identifier of the Metadata applicable to this content unit	S	In any order : "acquisitionPeriod" " platform" "orbitReference" "qualityInformation" "processing" "frameSet" "generalProductInformation" "slstrProductInformation"	1
	contentUnit						1…
		ID		Content unit ID	S	LST_IN_Unit	1
		unitType			S	'Measurement Data Unit'	1
		textInfo			S	'LST_in Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'LST_IN_Data'	1
	contentUnit						1
		ID		Content unit ID	S	LST_ANCILLARY_DS_Unit	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'LST ancillary Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1

Name				Description	Data Type	Value	Occ.
			dataObjectID	Data Object element ID	S	'LST_ANCILLARY_DS_Data'	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_FLAGS_IN_Unit'	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Global Flags Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_FLAGS_IN_Data'	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_INDICES_IN_Unit'	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Coordinates Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_INDICES_IN_Data'	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_TIME_IN_Unit'	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Coordinates Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_TIME_IN_Data'	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_CARTESIAN_xx_Unit', where xx= IN, TX	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Coordinates Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_CARTESIAN_xx_Data', where xx= IN, TX	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_GEODETIC_xx_Unit', where xx= IN, TX	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Coordinates Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_GEODETIC_xx_Data', where xx= IN, TX	1
	contentUnit						1

Name				Description	Data Type	Value	Occ.
		ID		Content unit ID	S	'SLSTR_GEOMETRY_TN_Unit'	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Solar and Satellite Annotation Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_GEOMETRY_TN_Data'	1
	contentUnit						1
		ID		Content unit ID	S	'SLSTR_MET_TX_Unit'	1
		unitType			S	'Annotation Data Unit'	1
		textInfo			S	'Meteorological Parameters Auxiliary Data Set'	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	'SLSTR_MET_TX_Data'	1

Table 8-1: Information Package Map for L2 LST SLSTR product

8.1.2 'SL_2_LST_BW' L2 Browse Product

The Information Package Map associated to the package of the SL_2_LST_BW product is reported in the next table.

Name				Description	Data Type	Value	Occ
contentUnit				The information package map contains one content unit that includes the product data component included in the product.	Content Unit Type		1
	ID			Identifier of the package	S	"packageUnit"	0..1
	unitType			Describes the type of data referenced by this content unit	S	"Information Package"	0..1
	textInfo			Textual description of the content unit	S	"SENTINEL-3 SLSTR Level 2 Browse Product"	0..1
	pdiID			Identifier of the Preservation Description;Information applicable to this content unit	S	"processing"	1
	dmdID			Identifier of the Metadata applicable to this content unit	S	In any order : "acquisitionPeriod" "platform" "orbitReference" "generalInformation" "qualityInformation" "processing" "frameSet"	1
	contentUnit						1
		ID		Content unit ID	S	brwImageXXUnit, XX=01, …, N	1
		unitType			S	"Measurement Data Unit"	1
		textInfo			S	"Pseudo Colour Image"	0..1
		dmdID		Attribute: Description Metadata Identifier	S		0..1
		dataObject Pointer					1
			ID	Data Object pointer ID	S		0..1
			dataObjectID	Data Object element ID	S	brwImageXXData, XX=01, …, N	1

Table 8-2: Information Package Map for L2 SLSTR Browse Products

8.2   Metadata Section

See AD-3 for the metadata general description.

8.3   Data Object Section

8.3.1   Measurement Data Files

8.3.1.1   "SL_2_LST" Level 2 Product

Data Objects for the SLSTR SL_2_LST Level 2 product are listed in the next table.

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the L2 product.	U	1..*	
	ID			Data Component;ID	S	1	'LST_IN_Data'
	byte Stream			Pointer to the Data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the data component file	U	1	

Name				Description	Data type	Occ.	Value
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"LST_in.nc"
			textInfo	Textual description of the Data Component	S	0..1	"Land Surface Temperature Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 8-3: SL_2_LST Data Objects

8.3.1.2   'SL_2_LST_BW' L2 Browse Products

Data Object for SLSTR Level 2 browse products is reported in the next table.

Note: The number of image files (N) depends on the configuration set for the execution on the IPF. According to this configuration, one or more scientific fields may be processed and generate images.

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the L1 product.	U	1..*	
	ID			Data Component;ID	S	1	brwImageXXData, XX=01, …, N
	byte Stream			Pointer to the Data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	One value among: "image/jpeg" " image/tiff" " image/png" " image/jp2"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		One value among: "<.scientificData>_BrwImage.jpeg" "<.scientificData>_BrwImage.tiff" "<.scientificData>_BrwImage.png" "<.scientificData>_BrwImage.jp2"
			textInfo	Textual description of the Data	S	0..1	"Pseudo Color Image File"

Name				Description	Data type	Occ.	Value
				Component			
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 8-4: SLSTR Browse Level 2 Data Object

8.3.2 Specific Annotation Data Files

Each Annotations Data File constitutes a Data Object composed as follows:

Name				Description	Data type	Occ.	Value
Data Object				This element references the Data Component included in the product.	U	1..*	
	ID			Data Component;ID	S	1	'LST_ANCILLARY_DS_Data'
	byte Stream			Pointer to the data Component	U	1..*	
		ID		Byte stream ID	S	0..1	
		mimeType		MIME type for the referenced Data Component	E	1	"application/x-netcdf"
		size		Size of the Data Object File	L	1	
		fileLocation		Description of the location of the Data component file	U	1	
			locator Type	Type of the file location	URL	0..1	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component	S		"LST_ancillary_ds.nc"
			textInfo	Textual description of the Data Component	S	0..1	"LST ancillary Data File"
		checksum		Checksum for the Data Component	U	1	
			checksumName		E	1	MD5

Table 8-5: LST ancillary Data Object

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9. PRODUCT SIZE

In the following table the approximate size of each SLSTR file composing the Level 2 products over one full orbit is given.

The following table enumerates the data sets based upon the description tables in section 7. The sizes computation assume 40,000 1 km records per orbit (or 80,000 0.5km records) for the purpose of size estimates. Values for the dimensions in the above tables are taken as follows.

n_k = 187 orphan pixels per row in the nadir 1 km view

n_k = 112 orphan pixels per row in the oblique 1 km view

n_k = 375 orphan pixels per row in the nadir 0.5 km view

n_k = 225 orphan pixels per row in the oblique 0.5 km view

(number of orphans is an evaluation ~12% of the number of pixels per row)

columns (1km nadir) = 1500

columns (1km oblique) = 900

columns (0.5km nadir) = 3000

columns (0.5km oblique) = 1800

rows (1km) = 40,000

rows (0.5km) = 80,000

columns (tie points nadir, oblique) = 130

rows (tie points nadir, oblique) = 40,000

n_det (1km) = 2

n_det (0.5 km) = 4

n_int = 2 parity of pixels

No file compression is applied.

9.1   SLSTR Level 2 Land products

9.1.1 SL_2_LST___

Element name	Description	Size in Gbytes
xfdumanifest.xml	**Sentinel-SAFE product manifest**	
LST_in.nc	1km LST measurement dataset	0,377
LST_ancillary_ds.nc	LST Interpretation supporting parameters	0,440
flags_in.nc	Nadir 1km global flags dataset	0,601
indices_in.nc	Nadir 1km scan, pixel and detector number dataset	0,314
time_in.nc	Nadir 1km time coordinate dataset	0,001
geodetic_in.nc	Nadir 1km geodetic coordinates dataset	0,628
cartesian_in.nc	Nadir 1km Cartesian coordinates dataset	0,503
geometry_tn.nc	16km nadir solar and satellite geometry dataset	0,232
geodetic_tx.nc	16km geodetic coordinates dataset	0,077
cartesian_tx.nc	16km Cartesian coordinates dataset	0,077
met_tx.nc	Meteorological parameters	1,937
Total		**5,351**

Table 9-1: SL_2_LST___ product size

9.2   Browse products

Due to the type and level of compression used in the processing, the size of the browse products cannot be easily defined. Compared to the volume of data of the measurement/annotation, this size may be considered negligible.

End of Document