



PREPARATION AND OPERATIONS OF THE MISSION PERFORMANCE
CENTRE (MPC) FOR THE COPERNICUS SENTINEL-3 MISSION

**Product Data Format Specification - SLSTR Level 2 Fire
Products**



*Mission
Performance
Centre*



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Changes Log

Version	Date	Changes
1.0	19/05/2017	First release
1.1	06/09/2018	feedbacks from CDR
1.2	30/09/2019	Feedbacks from Verification phase and adaptation following the correction of S7/F1 shift in SLSTR L1 IPF
<u>1.3</u>	<u>12/04/2021</u>	<u>correction of the thermal radiance units</u>

List of Changes

Version	Section	Answers to RID	Changes
1.1	4.2.1.3.1		Addition of a data source attributes for TCWV parameter
	4.2.1.3.1		Addition of a new parameter providing the number of fires detected in the 500m cluster
	4.2.1.3.1		Completion of the FRP summary flag
1.2	4.2.1.1		Inclusion of F1-specific annotation files
	4.2.1.4		
	4.2.1.3.1		Description of the Glint_Angle
	4.2.1.4		Alignment with latest SLSTR L1 PDFS
<u>1.3</u>	<u>4.2.1.3</u>	<u>SIIMPC-4799</u>	<u>Correction of the radiance units</u>



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1 Introduction

1.1 Purpose and Scope

This document aims to identify and specify the format of the Sentinel 3 SLSTR Level 2 Fire Radiative Power products, outputted in the frame of the New Product Activity.

Others SLSTR products from L0 to L2 are described in RD- 1 and ~~RD- 2RD- 2RD- 2~~.

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	In this section the format of SLSTR FRP Product is specified.
5	MANIFEST FILE	In this section details for the implementation of the manifest file is provided
6	PRODUCT SIZE	In this section the size of each file composing the FRP product is provided.

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.

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ID	Document	Reference
AD- 1	Sentinel 3 PDGS File Naming Convention	EUM/LEO-SEN3/SPE/10/0070 GMES-S3GS-EOPG-TN-09-0009, Issue 1.3, 07/11/2012
AD- 2	Product Data Format Specification - Product Structures	S3IPF.PDS.002, i1r6, 10/02/2015
AD- 3	Metadata Specification, Excel document	S3MPC.ACR.FRP.004 - i1r0 - SLSTR L2 Metadata Format Specification
AD- 4	XML Schemas.zip – Zip file containing all the schemas used to represent the metadata	S3IPF.PDS.009, i2r5 – 26/03/2015
AD- 5	Auxiliary Data Format Specification	S3MPC.ACR.FRP.005 - i1r0 - SLSTR L2 Auxiliary Data Format Specification


1.3.2 Reference documents

The following reference documents contain information supporting this document.

ID	Document	Reference
RD- 1	Product Data Format Specification - Level 0	S3IPF PDS 001 - Product Data Format Specification - Level 0
RD- 2	Product Data Format Specification – SLSTR Level 1 and 2	S3IPF PDS 005 - Product Data Format Specification - SLSTR
RD- 3	SLSTR Level 2 Input Output Data Description Document	S3-L2-SD-08-T-RAL-IODD Updated version, dedicated to FRP, to be delivered
RD- 4	Active Fire : Fire Detection And Fire Radiative Power Assessment – S3 SLSTR L2 FRP ATBD	S3-L2-SD-03-T04-KCL-ATBD Updated version to be delivered

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- 2](#)AD- 2AD- 2].

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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 an 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 focused 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 whole product tree for SLSTR instrument is provided in Figure 1. Note that we focus in this document only on the Fire Product (underlined in red).

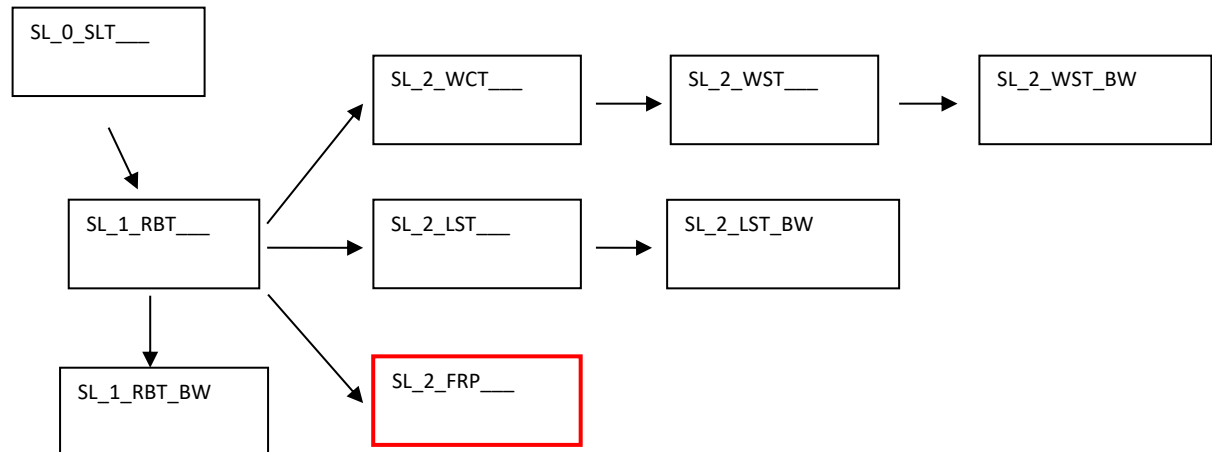


Figure 1 : SLSTR Product Tree

3.1 Product Tree

The whole S-3 SLSTR products are summarized in Table 1. Note that we describe in this document only on the Fire Product (underlined in red). The others SLSTR products are described in RD- 2.

Table 1 : SLSTR Product Tree

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
SL_2_WST___	Level 2P Sea Surface Temperature (GHRSSST like)	Level 2
SL_2_LST___	Land Surface Temperature geophysical parameters	Level 2
<u>SL_2_FRP___</u>	<u>Fire Radiative Power and associated parameters</u>	<u>Level 2</u>

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3.2 Product Naming Convention

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

4 SLSTR FRP PRODUCT FORMAT SPECIFICATION

4.1 General Product Structure

4.1.1 Package Layout

The format of every Sentinel 3 product is described in [~~AD-2AD-2AD-2~~]. The Product Package is sketched in figure 2.

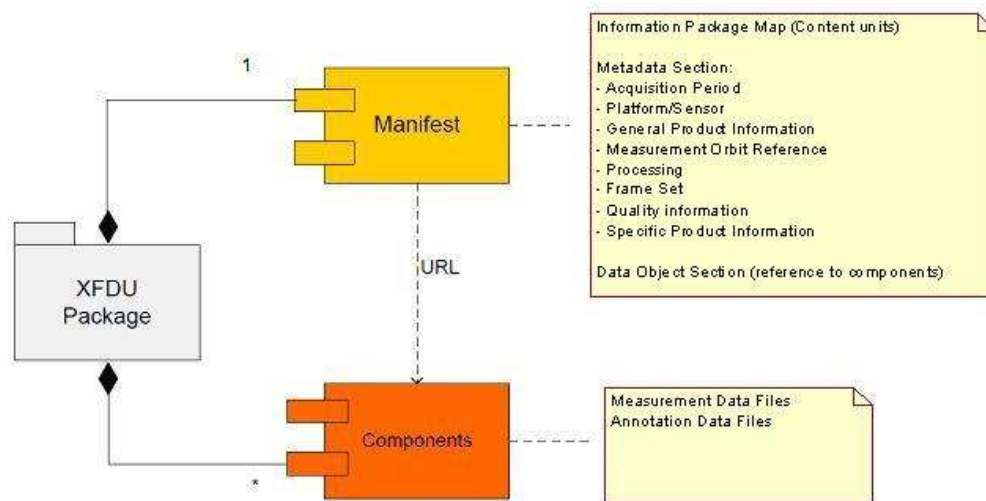


Figure 2: XFDU package


In the following sections, the physical composition of the Fire package is specified.

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”.

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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.

The fields are described in [AD- 3].

4.1.3 Measurement Data Files and Annotation Data Files

The format of the measurement and 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.

Note that variables attributes are not fully described here. For instance, the “Long_name” attributes have been removed from this table but is included for each variable, using the description of the variable to fill them.

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].

Additional global attributes are defined specifically for SLSTR L2 files. 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.

Table 2: Additional Global Attributes for SLSTR L1 and L2 files

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

4.2 Earth Observation Products

4.2.1 Level 2 Product: SL_2_FRP___

This product contains the Fire detection list and the associated Fire Radiative Power parameters.

4.2.1.1 Package Description and SL_2_FRP___ product summary

A “SL_2_FRP___” Level 2 product is composed of one measurement data files. In the following sections the content of the files is reported.

Table 3: SLSTR FRP Level 2 product physical composition

Product Package Type		Description			
SL_2_FRP___		Fire Detection and Fire Radiative Power 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
		14 ¹	1	13	0
Product Package Structure					
Manifest file (see section 4.1.2.1, 4.2.1.2 and 5 for more details)					
File name			Composition		
xfdumanifest.xml			XML fields		
Measurement Data files (see section 4.2.1.3 for more details)					
File name			Composition		

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



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FRP_in.nc	i, j, time, latitude, longitude, FRP_SWIR, FRP_MWIR, FRP_uncertainty_SWIR, FRP_uncertainty_MWIR, TCWV, transmittance_SWIR, transmittance_MWIR, IFOV_area, glint_angle, confidence, classification, window_size, flags
Annotation Data files (see section 4.2.1.4 for more details)	
File name	Composition
flags_in.nc	cloud_in, bayes_in, pointing_in, confidence_in, cloud_orphan_in, bayes_orphan_in, pointing_orphan_in, confidence_orphan_in
flags_fn.nc	cloud_fn, bayes_fn, pointing_fn, confidence_fn, cloud_orphan_fn, bayes_orphan_fn, pointing_orphan_fn, confidence_orphan_fn
indices_in.nc	scan_in, pixel_in, detector_in, scan_orphan_in, pixel_orphan_in, detector_orphan_in
indices_fn.nc	scan_fn, pixel_fn, detector_fn, scan_orphan_fn, pixel_orphan_fn, detector_orphan_fn
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
geodetic_fn.nc	latitude_fn, longitude_fn, elevation_fn, latitude_orphan_fn, longitude_orphan_fn, elevation_orphan_fn
cartesian_in.nc	x_in, y_in, x_orphan_in, y_orphan_in
cartesian_fn.nc	x_fn, y_fn, x_orphan_fn, y_orphan_fn
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
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	

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4.2.1.2 Manifest File

The structure of the Manifest element is described in [AD- 3AD- 3AD- 3]. According to [AD- 3AD- 3AD- 3], Wrapped Metadata are grouped in Primary Metadata, common to all Sentinel 3 products and Secondary Metadata, specific for instrument and processing level.

4.2.1.3 Measurement Data Files

4.2.1.3.1 SLSTR Level 2 Fire Radiative Power

The fire radiative power (FRP) dataset contains FRP, FRP uncertainty and other supporting fields. It is generated for each fire detected over the SLSTR 1km measurement grid. Note also that a flag is provided for each SLSTR 1 km image pixel to spot false alarm.

Table 4: SL_2_FRP__FRP_in description

Element name	Description	Range or value	T	D
fires	Fire list array size			
rows	Along track grid size			
columns	Across track grid size			
<common global attributes>	Common global attributes (see [AD- 3] and Table 2)			
i	Fire pixel across-track image grid index		i32	fires
j	Fire pixel along-track image grid index		i16	fires
time	Time		i64	fires
standard_name	CF standard name	time		1



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Element name	Description	Range or value	T	D
units	UDUNITS unit name	Microseconds since 2000-01-01T00:00:00		
latitude	Latitude	[-90; 90]	f64	fires
standard_name	CF standard name	latitude		1
units	UDUNITS unit name	degrees_north		1
longitude	Longitude	[-180; 180]	f64	fires
standard_name	CF standard name	longitude		1
units	UDUNITS unit name	degrees_east		1
FRP_MWIR	Fire radiative power computed from MWIR channels (S7 and F1)		f64	fires
units	UDUNITS unit name	MW		1
FRP_uncertainty_MWIR	Fire radiative power total uncertainty computed from MWIR channels (S7 and F1)		f64	fires
units	UDUNITS unit name	MW		1
transmittance_MWIR	Transmittance of path to fire computed from MWIR channels (S7 and F1)		f64	fires
FRP_SWIR	Fire radiative power computed from SWIR channels (S5 and S6)		f64	fires
units	UDUNITS unit name	MW		1
FRP_uncertainty_SWIR	Fire radiative power total uncertainty computed from SWIR channels (S5 and S6)		f64	fires
units	UDUNITS unit name	MW		1
transmittance_SWIR	Transmittance of path to fire computed from SWIR channels (S5 and S6)		f64	fires
confidence	Fire detection confidence	[0 ; 100]	f64	fires
classification	Hotspot classification code	See Table 6	u8	fires
flag_values	Flag values	See Table 6		1



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Element name	Description	Range or value	T	D
flag_masks	Flag masks	See Table 6		1
flag_meanings	Flag descriptions	See Table 6		1
S7_Fire_pixel_radiance	Fire pixel radiance computed from S7 brightness Temperature	[-32767, 32767]	i16	fires
standard_name	CF standard name	toa_radiance		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
units	UDUNITS unit name	W·m⁻²·sr⁻¹·μm⁻¹·mW·m⁻²·sr⁻¹·nm⁻¹		1
F1_Fire_pixel_radiance	Fire pixel radiance computed from F1 brightness Temperature	[-32767, 32767]	i16	fires
standard_name	CF standard name	toa_radiance		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
units	UDUNITS unit name	W·m⁻²·sr⁻¹·μm⁻¹·mW·m⁻²·sr⁻¹·nm⁻¹		1
used_channel	Boolean flag indicating which channel was used in the FRP calculation, with 0 referring to S7 channel and 1 to F1 channel	[0,1]		fires
Radiance_window	Average background window radiance used in the FRP equation. This radiance is associated with the channel defined by the used_channel parameter	[-32767, 32767]	i16	fires
standard_name	CF standard name	toa_radiance		1
scale_factor	Scaling factor used in decoding packed data	0.01		1
units	UDUNITS unit name	W·m⁻²·sr⁻¹·μm⁻¹·mW·m⁻²·sr⁻¹·nm⁻¹		1
Glint_angle	Angle between SLSTR viewing direction and the direction of the sun rays specifically reflected from the horizontal surface		f64	fires
units	UDUNITS unit name	degrees		1



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Element name	Description	Range or value	T	D
IFOV_area	Projected area of detector IFOV on surface		f64	fires
units	UDUNITS unit name	m2		1
TCWV	Total column water vapour above fire		f64	fires
standard_name	CF standard name	atmosphere_water_vapor_content		1
source	Data source	ECMWF files		1
units	UDUNITS unit name	kg m-2		1
n_window	Background window size		i16	fires
n_water	Number of water pixels in background window		i16	fires
n_cloud	Number of cloudy pixels in background window		i16	fires
n_SWIR_fire	Number of fires detected on the 500m grid using the S6 absolute test. This number is only relevant for oceanic or daytime land detected fires. The others cases are associated with a "-1" value	[0,4]	u16	fires
_FillValue	Value indicating missing data	-1		
flags	Fire test summary flags	See Table 5	i16	rows columns
flag_values	Flag values	See Table 5		1
flag_meanings	Flag descriptions	See Table 5		1
flag_maskss	Flag masks	See Table 5		1



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Table 5: FRP summary flag word values

Bit number	Value	Text Code	Description
0	1	exception	L1b pixel radiance exception
1	1	l1b_water	L1b water surface classification
2	1	frp_water	Water detected by FRP tests
3	1	l1b_cloud	Cloud detected by L1b tests
4	1	bayesian_cloud	Cloud detected by Bayesian tests
5	1	frp_cloud	Cloud detected by FRP tests
6	0	night	Pixel is in day or night
	1	day	
7	1	sun_glint	Sun glint
8	1	spectral_filter	Potential fire identified by spectral test
9	1	spatial_filter	Potential fire identified by spatial test
10	1	absolute_threshold	Fire identified by absolute threshold test
11	1	background_characterisation	Potential fire successful background characterisation
12	1	contextual_threshold	Potential fire confirmed by contextual threshold test
13	1	desert_boundary	Potential fire rejected by desert boundary test
14	0	No Fire	Normal fire have BT <500K
	1	Saturated fire	Saturation fire have BT >500K
15	0	Low confidence fire	Low confidence (0-50%)
	1	High confidence fire	High confidence (50-100%)
16	1	abs_bckg_invalid	if raised, Fire detected by absolute test but associated with unvalid background
17	1	saturated_area	if raised, pixel in located on a saturated area (i.e the percentage of S7-saturated pixel are higher than a certain threshold) and "classic" FRP detection cannot be processed over this pixel
18	1	cloud_edge	if raised, this potential fire pixel has been discarded due to neighboring cloudy pixels
19	1	land-water_edge	if raised, this potential fire pixel has been discarded due to too many neighbors with inconsistent surface classification.



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Table 6: FRP classification byte values

Bit number	Text Code	Description
0	vegetation_fire	If raised, suspected vegetation fire
1	onshore_gas_flare	if raised, suspected onshore gas flare
2	offshore_gas_flare	if raised, Suspected offshore gas flare
3	volcanic	if raised, Suspected volcanic hotspot
4	industrial	if raised, Suspected industrial hotspot
5	spare	spare
6	spare	spare
7	spare	spare

4.2.1.4 Annotation Data Files

4.2.1.4.1 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. In the SLSTR FRP product, two global flags are included : the one dedicated to the 1 km nadir view thermal channels and, since the F1 channels is now geolocated separately from the others thermal channels, the file dedicated to the 1 km nadir view F1 channel.

Table 7: Global flags data file description

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 Table 2)			
Probability_cloud_single_i<v>	Probability of cloud in pixel (single 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 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



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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 both views		1
cloud_<g><v>	Global cloud flags (basic SLSTR cloud tests)		u16	rows columns
flag_masks	Masks for each flag bit	See Table 8		1
flag_meanings	Text descriptions for each flag bit	See Table 8		1
bayes_<g><v>	Bayesian cloud flags	[0b; 100b]	u8	rows columns
flag_masks	Masks for each flag bit	See Table 9		1
flag_meanings	Text descriptions for each flag bit	See Table 9		1
pointing_<g><v>	Global pointing flags		u8	rows columns
flag_masks	Masks for each flag bit	See Table 10		1
flag_meanings	Text descriptions for each flag bit	See Table 10		1
confidence_<g><v>	Global confidence flags		u16	rows columns
flag_masks	Masks for each flag bit	See Table 11		1
flag_meanings	Text descriptions for each flag bit	See Table 11		1
cloud_orphan_<g><v>	Orphan pixel global cloud flags		u16	rows orphan_pixels
flag_masks	Masks for each flag bit	See Table 8		1



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Element name	Description	Range or value	T	D
flag_meanings	Text descriptions for each flag bit	See Table 8		1
bayes_orphan_<g><v>	Orphan pixel Bayesian cloud flags		u8	rows orphan_pixels
flag_masks	Masks for each flag bit	See Table 9		1
flag_meanings	Text descriptions for each flag bit	See Table 9		1
pointing_orphan_<g><v>	Orphan pixel global pointing flags		u8	rows orphan_pixels
flag_masks	Masks for each flag bit	See Table 10		1
flag_meanings	Text descriptions for each flag bit	See Table 10		1
confidence_orphan_<g><v>	Orphan pixel global confidence flags		u16	rows orphan_pixels
flag_masks	Masks for each flag bit	See Table 11		1
flag_meanings	Text descriptions for each flag bit	See Table 11		1



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Table 8: Cloud word definitions

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

Table 9: Bayesian 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	



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Table 10: Pointing word definitions

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 11: Confidence 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	



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Bit	Text code	Meaning if set	Comment
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	

4.2.1.4.2 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. In the SLSTR FRP product, two files are included : the one dedicated to the 1 km nadir view thermal channels and, since the F1 channels is now geolocated separately from the others thermal channels, the file dedicated to the 1 km nadir view F1 channel.

Table 12: Scan, Pixel and Detector Annotation data file description

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 Table 2)			
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



Element name	Description	Range or value	T	D
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
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

4.2.1.4.3 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. The dataset is generated in the image frame. The dataset is encoded in NetCDF 4. In the SLSTR FRP product, two files are included : the one dedicated to the 1 km nadir view thermal channels and, since the F1 channels is now geolocated separately from the others thermal channels, the file dedicated to the 1 km nadir view F1 channel.



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Table 13: Full Resolution Cartesian Coordinates Annotation data file description

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 Table 2)			
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



Element name	Description	Range or value	T	D
_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
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

4.2.1.4.4 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).

Table 14: Tie Points Cartesian Coordinates Annotation data file description

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 Table 2)			
x_<g><v>	Geolocated x (across track) coordinate of detector FOV centre		f64	rows columns
units	UDUNITS unit name	m		1



Element name	Description	Range or value	T	D
y_<g><v>	Geolocated y (along track) coordinate of detector FOV centre		f64	rows columns
units	UDUNITS unit name	m		1

4.2.1.4.5 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. In the SLSTR FRP product, two files are included : the one dedicated to the 1 km nadir view thermal channels and, since the F1 channels is now geolocated separately from the others thermal channels, the file dedicated to the 1 km nadir view F1 channel.

Table 15: Full Resolution Geodetic Coordinates Annotation data file description

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 Table 2)			
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



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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	-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
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



Element name	Description	Range or value	T	D
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

4.2.1.4.6 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.



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Table 16: Tie points Geodetic Coordinates Annotation data file description

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 Table 2)			
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



4.2.1.4.7 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 able to retrieve the exact acquisition time of each instrument pixel. The dataset is encoded in NetCDF 4. In the SLSTR FRP product, only the 1 km nadir view cloud file is included.

Table 17: Time Annotation data file description

Element name	Description	Range or value	T	D
rows	Along track grid size			
<common global attributes>	Common global attributes (see [AD- 3] and Table 2)			
time_stamp_<g>	Time at which the sub-satellite point crosses the image row		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 consisting of exactly 3670 1km (or 7340 500m) pixel acquisitions		i32	1
units	UDUNITS unit name	us		1
PIXSYNC_<g>	Time sampling interval for pixels along each scan		i64	1
units	UDUNITS unit name	us		1
NADIR_FIRST_PIXEL_<g>	First pixel acquisition in nadir view relative to SCANSYNC		i32	1
OBLIQUE_FIRST_PIXEL_<g>	First pixel acquisition in oblique view relative to SCANSYNC		i32	1
Nadir_First_scan_<g><v>	Scan number of the first Nadir scan contributing to each line	[0; 32766]	u16	rows



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Element name	Description	Range or value	T	D
_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
Nadir_Minimal_ts_<g><v>	Time at SCANSYNC of the first scan contributing to each nadir image row.		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>	Time at SCANSYNC of the last scan contributing to each nadir image row.		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>	Time at SCANSYNC of the first scan contributing to each oblique image row.		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



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Element name	Description	Range or value	T	D
Oblique_Maximal_ts_<g><v>	Time at SCANSYNC of the last scan contributing to each oblique image row.		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



4.2.1.4.8 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. Only the nadir view file is included in the FRP product

Table 18: Solar and Satellite Geometry Annotation data file description

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 Table 2)			
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



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

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4.2.1.4.9 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 preceding 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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Table 19: Meteorological Annotation data file description

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 Table 2)			
t_forecast_tx	For forecast parameters, the time of the analysis from which the forecast was made	0	i16	
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"hours since..."		1
t_single	Synoptic time of single time fields	0	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	[-18; 6]	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



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Element name	Description	Range or value	T	D
t_bound	Start and stop times for integrated products	[-24; 6]	i16	t_series n_bound
standard_name	CF standard name	"time"		1
units	UDUNITS unit name	"hours since..."		1
axis	Coordinate axis identifier	"T"		1
z_wind	Height of wind field above surface	10	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	2	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	7e-2	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	(0, 7e-2)	i16	z_soil n_bound



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Element name	Description	Range or value	T	D
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
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



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Element name	Description	Range or value	T	D
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
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



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Element name	Description	Range or value	T	D
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
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



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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)	"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
units	UDUNITS unit name	"kg m-2"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"137"		1



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Element name	Description	Range or value	T	D
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)	« 32 »		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



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Element name	Description	Range or value	T	D
units	UDUNITS unit name	"m"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"140"		1
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



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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)	"235"		1
snow_depth_tx	Snow liquid water equivalent depth		f32	t_single rows columns
standard_name	CF standard name	"lwe_thickness_of_surface_snow_amount"		1
units	UDUNITS unit name	"metre"		1
model	Model identifier	(Note 1)		1
parameter	Parameter identifier (e.g. ECMWF GRIB code)	"141"		1

Note 1: The model attribute should contain a code to identify the source (e.g. ECMWF) 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

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.

5.1 InformationPackageMap of 'SL_2_FRP___' Level 2 Product

Table 20: Information Package Map for L2 FRP SLSTR product

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 Fire 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						0...
		ID		Content unit ID	S	FRP_IN_Unit	1
		unitType			S	'Measurement Data Unit'	1
		textInfo			S	'FRP 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	'FRP_IN_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



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Name			Description	Data Type	Value	Occ.
		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_FLAGS_FN_Unit'	1
		unitType		S	'Annotation Data Unit'	1
		textInfo		S	'Global Flags Annotation Data Set dedicated to F1'	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_FN_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_INDICES_FN_Unit'	1
		unitType		S	'Annotation Data Unit'	1
		textInfo		S	'Coordinates Annotation Data Set dedicated to F1'	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_FN_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



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Name			Description	Data Type	Value	Occ.
	ID		Content unit ID	S	'SLSTR_CARTESIAN_xx_Unit', where xx= IN, FN, 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, FN, TX	1
	contentUnit					1
	ID		Content unit ID	S	'SLSTR_GEODETTIC_xx_Unit', where xx= IN, FN, 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_GEODETTIC_xx_Data', where xx= IN, FN, TX	1
	contentUnit					1
	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

5.2 Metadata Section

See AD-3 for the metadata general description.



5.3 Data Object Section

5.3.1 Measurement Data Files of “SL_2_FRP” Level 2 Product

Data Objects for the SLSTR SL_2_FRP Level 2 product are listed in the next table.

Table 21: SL_2_FRP Data Objects

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	'FRP_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	
		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		"FRP_in.nc"
		textInfo	Textual description of the Data Component	S	0..1	"Fire Radiative Power Data File"
		checksum	Checksum for the Data Component	U	1	



Name			Description	Data type	Occ.	Value
		checksumName		E	1	MD5

5.3.2 Annotation Data Files

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

Table 22: 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_FLAGS_IN_Data', 'SLSTR_FLAGS_FN_Data',
	byte Stream		Pointer to the data Component	U	1..*	
		ID	Byte stream ID	S	0..1	
		contentType	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		"flags_in.nc", "flags_fn.nc",
		textInfo	Textual description of the Data Component	S	0..1	"Global Flags Annotation Data File"
		checksum	Checksum for the Data Component	U	1	



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Name			Description	Data type	Occ.	Value
		checksumName		E	1	MD5

Table 23: 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_INDICES_IN_Data', 'SLSTR_INDICES_FN_Data'
	byte Stream		Pointer to the data Component	U	1..*	
		ID	Byte stream ID	S	0..1	
		contentType	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_in.nc", "indices_fn.nc",
		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	



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Name			Description	Data type	Occ.	Value
		checksumName		E	1	MD5

Table 24: 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_CARTESIAN_xx_Data”, where xx= IN, FN, TX
	byte Stream		Pointer to the data Component	U	1..*	
		ID	Byte stream ID	S	0..1	
		contentType	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 = in, fn, 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



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Table 25: 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_GEODETTIC_xx_Data', where xx=IN, FN, 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 = in, fn, 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



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Table 26: 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_TIME_IN_Data',
	byte Stream	Pointer to the data Component	U	1..*	
		ID			
		Byte stream ID	S	0..1	
		contentType			
		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_in.nc";
		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



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Table 27: 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_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



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Table 28: Meteorological Parameters Auxiliary 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	
		contentType	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

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6 XML SCHEMA

The xml schemas used to generate the product manifest are provided as separate files (see AD- 4).

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7 PRODUCT SIZE

In the following table the approximate size of each SLSTR file composing the Level 2 FRP product over one full orbit is given. Note that the number of detected files **has a very minor impact on product size as the largest part is due to annotations files.**

Only the size and the content of FRP_in.nc file will be impacted by the number of fires. The size of annotations files will remain constant as these files are representative of the whole SLSTR image and not only the detected fires. The annotations files will be a duplication of the SLSTR L1 annotation files and provided even if no fire is detected.

In case of no confirmed fire, the FRP_in.nc will still be outputted but we only contained the flag parameter.

The following table enumerates the data sets based upon the description tables in section 4. The sizes computation assumes 40,000 1 km records per orbit for the purpose of size estimates. Values for the dimensions in the above tables are taken as follows.

- ❖ N_fires =1000
- ❖ columns (1km nadir) = 1500
- ❖ rows (1km) = 40,000
- ❖ n_k= 187 orphan pixels per row in the nadir 1 km view (number of orphans is an evaluation ~12% of the number of pixels per row)
- ❖ columns (tie points nadir, oblique) = 130
- ❖ rows (tie points nadir, oblique) = 40,000

No file compression is applied.

Table 29: SL_2_FRP___ product size

Element name	Description	Size in Gbytes
xfdumanifest.xml	Sentinel-SAFE product manifest	
FRP_in.nc	1km fire radiative power measurement dataset	0,113
flags_in.nc	Nadir 1km global flags dataset	0.601
flags_fn.nc	Nadir 1km global flags dataset – dedicated to F1 channel	0.601
indices_in.nc	Nadir 1km scan, pixel and detector number dataset	0.314
indices_fn.nc	Nadir 1km scan, pixel and detector number dataset – dedicated to F1 channel	0.314
time_in.nc	Nadir 1km time coordinate dataset	0.001
geodetic_in.nc	Nadir 1km geodetic coordinates dataset	0.628
geodetic_fn.nc	Nadir 1km geodetic coordinates dataset – dedicated to F1 channel	0.628
cartesian_in.nc	Nadir 1km Cartesian coordinates dataset	0.503
cartesian_fn.nc	Nadir 1km Cartesian coordinates dataset – dedicated to F1 channel	0.503
geometry_tn.nc	16km nadir solar and satellite geometry dataset	0.232
geodetic_tx.nc	16km geodetic coordinates dataset	0.077



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cartesian_tx.nc	16km Cartesian coordinates dataset	0.077
met_tx.nc	Meteorological parameters	1.937
Total		6.531

End of document