

EUMETSAT - Copernicus Sentinel-3 SLSTR L2 NRT FRP Auxiliary Data Format Specification

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EUMETSAT
Eumetsat-Allee 1, D-64295 Darmstadt, Germany
Tel: +49 6151 807-7
Fax: +49 6151 807 555
<http://www.eumetsat.int>

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Change Record

Version	Date	DCR* No. if applicable	Description of Changes
V1.0	18/03/2020		Initial
V1.A	30/03/2020		Modification report / file name IPF Code version non indicated anymore (for internal document management tool convenience). Acronym list updated. Updated product size, and FRP data content.
V1.B	28/09/2020		Update format table, and removal common parts to all product structure / manifest (available in other common documents).

***DCR = Document Change Request**

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1 INTRODUCTION

1.1 Scope

This document describes the format of the Auxiliary Data Files (ADF) associated with the production of the Near Real Time (NRT) Level 2 (L2) Fire Radiative Power (FRP) product generated from the Copernicus Sentinel-3 (S3) Sea and Land Surface Temperature Radiometer (SLSTR) by EUMETSAT. All described ADFs are application to the latest deployed processor version [RD-5], associated with the Algorithm Theoretical Basis Document (ATBD) [RD-3].

1.2 Applicable Documents

	Document Title	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	EUMETSAT - Copernicus Sentinel-3 SLSTR L2 NRT FRP Product Data Format Specification	EUM/SEN3/DOC/20/1169482, v1.B, 28/09/2020.
AD-3	Metadata Specification, Excel document	S3MPC.ACR.FRP.004 - i1r0 - SLSTR L2 Metadata Format Specification
AD-4	Sentinel 3 Global Auxiliary Data Format Specification	S3IPF PDS 007 - i2r4 - Auxiliary Data Format Specification
AD-5	Product Data Format Specification - Product Structures	S3IPF.PDS.002, Issue 1.6, 10/02/2015

1.3 Reference Documents

	Document Title	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	Active Fire : Fire Detection And Fire Radiative Power Assessment – S3 SLSTR L2 FRP ATBD	S3-L2-SD-03-T04-KCL-ATBD_FIREPRODUCT, v4.3, 31/10/2019.
RD-4	Earth Observation Mission CFI Software EO_DATA_HANDLING Software User Manual	EO-MA-DMS-GS-0007
RD-5	EUMETSAT - S3AB - FRP - IPF Processing Baseline Document	EUM/RSP/DOC/20/116847 3, v1.1, 11/03/2020.

1.4 Terminology

AD	Applicable Document
ADF	Auxiliary Data File
ATBD	Algorithm Theoretical Basis Document
CFI	Customer Furnished Items
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FRP	Fire Radiative Power
IPF	Instrument Processing Facility
L1	Level 1
L2	Level 2
NRT	Near Real Time
PDGS	Payload Data Ground Segment
RSP	Remote Sensing and Products division
RD	Reference Document
SLSTR	Sea and Land Surface Temperature Radiometer
SWIR	Short Wave-InfraRed
TIR	Thermal InfraRed

1.5 Document Structure

This document is structured as follow:

- S3 PDGS auxiliary data structure in Section 2;
- S3 PDGS auxiliary data files in Section 3;
- SLSTR NRT FRP ADF in Section 4.

2 S3 PDGS AUXILIARY DATA STRUCTURE

The format of auxiliary data files is based on the Payload Data Ground Segment (PDGS) Product guidelines. Each ADF includes a manifest and a measurement data file. The manifest follows the standard manifest structure of the S3 product as described in [AD-5 and AD-6].

External Auxiliary data are converted into adequate S3 Format upon entry into the PDGS, with the addition of a manifest file that includes a Data Object Section pointing to the original auxiliary file. The original file is not modified.

3 S3 PDGS AUXILIARY DATA FILES

ADFs are used by the S3 IPF to process, calibrate or improve the payload science data. They can be either static or dynamic, originate from multiple sources (*i.e.* internal or external to the S3 PDGS). This may include calibration data that is measured on board or generated from external sources other than the satellite.

3.1 Common ADF

Table 2 provide the list of Auxiliary Data Files used within the Sentinel-3 PDGS that are commonto all L2 IPFs.

Table 1: Common ADF list

File	Pro c. Lev el	Intern al/ Extern al	Static/ Dyna mic	Refere nce Source	Genera tion Freque ncy	Format	Product Type Original	Product Type PDGS	Auxili ary Data Size
FOS Orbit File (Predicted)	L0, L1, L2	E	D	FOS	Daily	Data File in Earth Explorer Format containing both Header and Data Block information (.EOF) [GM-IC-ESC-FS-3001]	MPL_ORB PRE	AX__FP O_AX	0.01
FOS Orbit File (Restituted)	L0, L1, L2	E	D	FOS	Daily	Data File in Earth Explorer Format containing both Header and Data Block information (.EOF) [GM-IC-ESC-FS-3001]	MPL_ORB RES	AX__FR O_AX	1.7
ECMWF Meteorological Data (Forecast) FC SFC and FC PL	L1, L2	E	D	ECMWF	6 hours	GRIB-1 [GMES-GSEG-EOPG-IC-11-0049]	-	AX__M F1_AX	360
ECMWF Meteorological Data (Analysis) AN SFC + PL	L1, L2	E	D	ECMWF	6 hours	GRIB-1 [GMES-GSEG-EOPG-IC-11-0049]	-	AX__M A1_AX	820
ECMWF Meteorological Data (Analysis) AN ML	L2	E	D	ECMWF	6 hours	GRIB-2 [GMES-GSEG-EOPG-IC-11-0049]	-	AX__M A2_AX	750
ECMWF Meteorological Data (Forecast) FC ML	L2	E	D	ECMWF	6 hours	GRIB-2 [GMES-GSEG-EOPG-IC-11-0049]	-	AX__M F2_AX	3000
Universal Constants File	L1, L2	I	S	PDGS (L1 GPP)	Infrequently	ASCII [GNSS IODD L0/L1b - SY-04/SY-21]	-	AX__CS T_AX	0.01
Reference Orbit Scenario File	L0, L1, L2	E	D	Mission Planning	6 months	Data File composed of Fixed Header and Data Block included in a single file *. EOF and then tarred and compressed as a *.TGZ [ES-GSEG-EOPG-TN-11-0007]	MPL_ORB SCT	AX__OS F_AX	0.03

4 SLSTR L2 NRT FRP ADF

Table 6 lists all the ADFs specific to the NRT SLSTR L2 FRP IPF. They are further described in the next sub-sections.

Table 2: SLSTR L2 FRP ADF list

File	Proc. Level	Internal/External	Static/Dynamic	Reference Source	Generation Frequency	Format	Product Type PDGS	Auxiliary Data Size (MB)
Processing Control Parameter File	L2	I	S	IPF Consortium (SLSTR L2P TDS)	Infrequently	XML	SL_2_PCP_FAX	0.02
S6 Nadir Shortwave Infrared Noise Data File	L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	NetCDF4	SL_2_S6N_AX	0.032
Thermal Infrared (TIR) Noise Data File	L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	NetCDF4	SL_2_S7N_AX SL_2_F1N_AX	0.032 MB / file
FRP Test Data File	L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	XML	SL_2_FRP_TAX	0.028
GLC2000 global mask	L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	<i>GeoTIFF tiled containing a two-dimensional array, using one byte per pixel in a regular equidistant latitude/longitude projection</i>	SL_2_PLF_MAX	417
Classification Fire Mask Data File	L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	XML	SL_2_CF_M_AX	0.048
S7 and F1 Pixel area Data File	L2	I	S		Infrequently	NetCDF4	SL_2_SXP_AAX SL_2_FXP_AAX	0.032 0.020
S7 Thermal Infrared (TIR) Characterisation Data File	L1 / L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	NetCDF4	SL_1_N_S7AX	0.04
S8 Thermal Infrared (TIR) Characterisation Data File	L1 / L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	NetCDF4	SL_1_N_S8AX	0.04
F1 Thermal Infrared (TIR) Characterisation Data File	L1 / L2	I	S	PDGS (delivered with L2 PAD)	Infrequently	NetCDF4	SL_1_N_F1AX	0.04

4.1 Processing control parameter file

The SLSTR L2 FRP Processing Control Parameter (PCP) contains the NRT L2 FRP processor configuration parameters. Note that for the FRP IPF v2.0, the nominal configuration is based on the surface cover classification provided by GLC2000 mask instead of SLSTR L1 products and the cloud mask is computed through internal tests and not derived from SLSTR L1 products.

The v2.0 processing requires to decide between F1_SWITCH ON and OFF. The current nominal configuration is defined as F1_SWITCH = OFF.

Table 3: Description of SLSTR L2 FRP ADF Processing control parameter

FILE Type	Update rate	Size
SL_2_PCPFAX	Infrequently	0.02 MB

Element name	Description	Range or value	T	D
<global common attributes>	Common global attributes			
switches				
SW_FRP_err	Switch enabling the computation and the outputting of FRP_uncertainty	[0, 1]	uc	1
SW_interface	switch disabling/enabling the cloud/water edge rejection test	[0,1]	uc	1
SW_CEdge_bekg	Switch enabling/disabling the ratio test indicating Cloud edge in background processing	[0,1]	uc	1
SW_F1	Switch enabling/disabling the computation of all FRP using F1 measurements	[0,1]	uc	0
SW_surface	Switch enabling/disabling the use of CGL200 surface maps instead of SLSTR L1 surface classification	[0, 1]	uc	1
Land processing branch				
SW_BAYESIAN	Switch to enable the bayesian flag	[0, 1]	B	1
SW_CLOUD_GROSS_CLOUD	Switch to take into account the gross_cloud cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_THIN_CIRRUS	Switch to take into account the thin_cirrus cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_MEDIUM_HIGH	Switch to take into account the medium_high cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_FOG_LOW_STRATUS	Switch to take into account the fog_low_stratus cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_16_SMALL_SCALE	Switch to take into account the 1.6_small_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_16_LARGE_SCALE	Switch to take into account the 1.6_large_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_11_12_NA	Switch to take into account the 11_12_view_difference cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_37_11_NA	Switch to take into account the 3.7_11_view_difference cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_VISIBLE	Switch to take into account the visible cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_IR_HIST	Switch to take into account the thermal_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_225_SMALL_SCALE	Switch to take into account the 2.25_small_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_225_LARGE_SCALE	Switch to take into account the 2.25_large_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1

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Element name	Description	Range or value	T	D
SW_CLOUD_137_TEST	Switch to take into account the 1.37_threshold cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
Ocean Processing Branch				
SW_BAYESIAN	Switch to enable the bayesian flag	[0, 1]	B	1
SW_CLOUD_GROSS_CLOUD	Switch to take into account the gross_cloud cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_THIN_CIRRUS	Switch to take into account the thin_cirrus cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_MEDIUM_HIGH	Switch to take into account the medium_high cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_FOG_LOW_STRATUS	Switch to take into account the fog_low_stratus cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_16_SMALL_SCALE	Switch to take into account the 1.6_small_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_16_LARGE_SCALE	Switch to take into account the 1.6_large_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_11_12_NA	Switch to take into account the 11_12_view_difference cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_37_11_NA	Switch to take into account the 3.7_11_view_difference cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_VISIBLE	Switch to take into account the visible cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_IR_HIST	Switch to take into account the thermal_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_225_SMALL_SCALE	Switch to take into account the 2.25_small_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_225_LARGE_SCALE	Switch to take into account the 2.25_large_histogram cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
SW_CLOUD_137_TEST	Switch to take into account the 1.37_threshold cloud flag in the computation of a new summary_cloud	[0, 1]	B	1
Global parameters				
T_missing	Percentage of unfilled pixels above which a line of the image is considered affected by a gap	75	us	1
classic_day_fraction_threshold	maximum percentage of saturated pixels accepted in a sub-scene to be computed through this algorithm	0.01	us	1
F1_saturated	maximum limit above which F1 brightness temperature is saturated	500	us	1
S7_non_linear	maximum limit above which S7 brightness temperature is nonlinear with a decreasing accuracy	311	us	1
T_cloud_edge	Threshold rejecting a potential fire due to cloud edge – first value is associated with daytime, the second one with nighttime	330, 310	us	2
T_land_edge	Threshold rejecting a potential fire over ocean due to land edge – first value is associated with daytime, the second one with nighttime	330, 310	us	2
T_water_edge	Threshold rejecting a potential fire over land due to water edge – first value is associated with daytime, the second one with nighttime	311, 310	us	2
T_night_absolute	Threshold defining SLSTR nighttime acquisition that will be processed through absolute test	100	us	1

Element name	Description	Range or value	T	D
dist_classif	maximal distance between a fire and a well-known location on classification maps (kilometers)	10	us	1
Earth_radius	radius of Earth (kilometers)	6371	D	1
Cste_SBoltzmann	Constant of stefan-Boltzmann	5.67*10-8	D	1
TH_S7S2_cloudEdge	Threshold applied on the ratio S7/S2 fractional radiance to reject false alarm due to cloud edge	0.018	D	1
TH_S7S8_cloudEdge	Threshold applied on the ratio S7/S8 fractional radiance to reject false alarm due to cloud edge	0.08	D	1
TH_S7_cloudEdge1	Threshold applied on S7 Brightness temperature to reject false alarm due to cloud edge	330	D	1
TH_S7_cloudEdge2	Threshold applied on S7 Brightness temperature to reject false alarm due to cloud edge – 2 nd test associated with SW13f test	310	D	1
F1_cluster_expansion	Expansion of the window size for the F1 cluster based on the size of the S7 cluster	10	us	1

4.2 S6 nadir SWIR noise data file

The SLSTR L2 S6 Nadir Shortwave InfraRed (SWIR) Noise Data File contains a Look-Up Table (LUT) which maps measurements of detector noise for individual S6 nadir measurement pixels. The file is in NetCDF format

Table 4: Description of SLSTR L2 FRP ADF S6 Noise data

FILE Type	Update rate	Size
SL_2_S6N_AX	Infrequently	0.032 MB

Element name	Description	Range or value	T	D
<global common attributes>	Common global attributes			
integrators	Number of integrators	[1, 2]		
detectors	Number of nadir detectors	4		
radiances	Number of radiances in NEdL_LUT			
T_detectors	Number of detector temperatures in NEdL_LUT			
radiances	Radiances of NEdL_LUT		D	radiances
units	UDUNITS unit name	W.m-2.st-1.nm-1	S	1
T_detectors	Detector temperatures of NEdL_LUT		D	T_detectors
units	UDUNITS unit name	K	S	1

Element name	Description	Range or value	T	D
NEdL_LUT	S6 nadir single pixel NEdL estimate LUT		D	integrators detectors radiances T_detectors
units	UDUNITS unit name	W.m-2.sr-1.nm-1	S	1

4.3 TIR noise data files

The SLSTR L2 Thermal Infrared (TIR) Noise Data files contain LUTs which map measurements of detector noise over the SLSTR internal calibration black bodies to estimate individual measurement noise per pixel. There is one NetCDF file for each of channels S7, and F1 – nadir view:

- S7 nadir thermal infrared noise dataset
- F1 nadir thermal infrared noise datasetThe files are in NetCDF format.

Table 5: Description of SLSTR L2 FRP ADF TIR Noise data

FILE Type	Update rate	Size
SL_2_S7N_AX SL_2_F1N_AX	Infrequently	0.032 MB / file

Element name	Description	Range or value	T	D
<global common attributes>	Common global attributes			
integrators	Number of integrators	[1, 2]		
detectors	Number of nadir detectors	2		
B_temperatures	Number of brightness temperatures in NEdT_LUT			
T_detectors	Number of detector temperatures in NEdT_LUT			
B_temperatures	Brightness temperatures of NEdT_LUT		D	B_temperatures
units	UDUNITS unit name	K	S	1
T_detectors	Detector temperatures of NEdT_LUT		D	T_detectors
units	UDUNITS unit name	K	S	1
NEdT_LUT	SLSTR channel nadir single pixel NEdT estimate LUT		D	integrators detectors B_temperatures T_detectors
units	UDUNITS unit name	K	S	1

4.4 FRP test data file

The SLSTR L2 FRP Test Data File contains the FRP thresholds or parameter values for all tests applied for hot spot detection. Note that two files are included in this ADF. A first one in xml format gathers all thresholds or required parameters for the detection of fires and computation of the FRPs. The second one, in csv format, includes a look-up-table to account for the Total Column Water Vapor (TCWV) transmittance. The csv file, named SL_2_ATMCOR, includes a look-up-table with 5 columns and 12 rows. For each level of TCWV, the optical thickness and the three coefficients required for the computation of the transmittance can be extracted.

Table 6: Description of SLSTR L2 FRP ADF test data in xml format

FILE Type	Update rate	Size
SL_2_FRPTAX	Infrequently	0.008 MB

Element name	Description	Range or value	Unit	T	C
Solar geometry Test					
zenith_threshold	solar zenith angle threshold for day/night	85	degrees	D	1
Water Tests					
NDVI_threshold	NDVI threshold	0		D	1
S6_threshold	S6 threshold	0.05		D	1
S3_threshold	S3 threshold	0.15		D	1
Cloud Tests					
l1b_mask	L1b cloud flags mask	[1 ; 8192]		us	1
bayesian_mask	Bayesian cloud flags mask	[1; 8]		us	1
S2S3_threshold1	First S2 + S3 reflectance threshold	0.9		D	1
S9_threshold1	First S9 brightness temperature threshold	265	K	D	1
S2S3_threshold2	Second S2 + S3 reflectance threshold	0.7		D	1
S9_threshold2	Second S9 brightness temperature threshold	285	K	D	1
S7S8_threshold3	third S7 and S8 brightness temperature difference threshold	4	K	D	1
S9_threshold3	third S9 brightness temperature threshold	273	K	D	1
Sun glint Tests					
angle_threshold1	First angle test	2	degrees	D	1
S2_threshold	S2 reflectance test	0.15		D	1
angle_threshold2	Second angle test	8	degrees	D	1
S7S3_factor	S7/S3 ratio test	0.01		D	1
Sub-scene Tests					
nj	Sub-scene along track dimension (nadir 1km pixels)	750		ss	1

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Element name	Description	Range or value	Unit	T	C
ni	Sub-scene across track dimension (nadir 1km pixels)	600		ss	1
land_factor	Validity test (fraction of land pixels)	0.1	%	D	1
ocean_factor	Validity test (fraction of ocean pixels)	0.1	%	D	1
cloud_factor	Validity test (fraction of cloud-free pixels)	0.01	%	D	1
box_min	Minimum sub-scene cell range to search when patching statistics	1		ss	1
box_max	Maximum sub-scene cell range to search when patching statistics	3		ss	1
neighbour_threshold	Minimum number of neighbour cells for successful patch	1		ss	1
Spectral Tests					
S8dynamic_threshold	S8 BT difference threshold	-3	K	D	1
S7day_threshold	S7 BT default daytime threshold – first value associated with land, second one with ocean	310; 295	K	D	2
S7S8day_threshold	S7-S8 BT difference default daytime threshold – first value associated with land, second one with ocean	5; 1	K	D	2
S8day_threshold	S8 BT default daytime threshold (= 0)	0	K	D	1
S7night_threshold	S7 BT default night time threshold	290	K	D	1
S7S8night_threshold	S7-S8 BT difference default night time threshold	3	K	D	1
S8night_threshold	S8 BT default night time threshold (= 0)	0	K	D	1
zenith_factor	S7 BT daytime threshold correction	-0.3	K.deg rees-1	D	1
Spatial Tests					
kernel_min	Minimum kernel size	3		ss	1
kernel_max	Maximum kernel size	9		ss	1
sd_factor	Pixel test against background standard deviation (11)	1.5		D	1
sd_threshold	Default threshold test	3, 10, 20, 50		D	4
Absolute Tests					
F1day_threshold	F1 BT daytime threshold	360	K	D	1
F1night_threshold	F1 BT night time threshold	320	K	D	1
S6_factor	S6 radiance noise factor	0.05		D	1
S6_scale	S6 radiance noise scale	2		ss	1
Background Tests					
S7day_threshold	S7 BT daytime threshold – first value associated with land, second one with ocean	311; 315	K	D	2
S7S8day_threshold	S7-S8 BT daytime threshold – first value associated with land, second one with ocean	20; 10	K	D	2
S7night_threshold	S7 BT night time threshold	310	K	D	1
S7S8night_threshold	S7-S8 BT night time threshold	10	K	D	1
window_min	Minimum window range	5		ss	1
window_max	Maximum window range	21		ss	1
window_exclude	Absolute threshold minimum window range	3		ss	1
window_absolute	Absolute threshold maximum window range	51		ss	1
window_factor	Valid pixels fraction of total pixels	25	%	D	1

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Element name	Description	Range or value	Unit	T	C
window_threshold	Minimum number of valid pixels required in a valid background window in case of absolute fire	50		ss	1
CloudEdge_threshold	MIR/TIR radiance ratio threshold	0.05		D	1
Contextual threshold tests					
S7S8_factor	S7-S8 BT fraction of S7-S8 BT MAD – first value associated with land, second one with ocean	3.2; 2	K	D	2
S7S8_threshold	S7-S8 BT offset – first value associated with land, second one with ocean	5.6; 2.5	K	D	2
S7_factor	S7 BT fraction of S7 BT MAD – first value associated with land, second one with ocean	3; 2		D	2
S8_threshold	S8 BT fraction of S8 BT MAD – first value associated with land, second one with ocean	-4; -2	K	D	2
S7_threshold	S7 BT MAD threshold – first value associated with land, second one with ocean	5; 3.5	K	D	2
Desert false alarm tests					
nv_factor	Nf fraction of Nv	0.1		D	1
nf_threshold	Nf threshold	4		ss	1
S3_threshold	S3 reflectance threshold	0.15		D	1
S7bf_threshold	S7 BT threshold	345	K	D	1
S7bfmad_threshold	S7 BT MAD threshold	3	K	D	1
S7bfmad_factor	S7 BT fraction of S7 BT MAD	6		D	1
Fire radiative power calculations					
S7_solid_angle	S7 detector pixel solid angle	1.5625e-6	sr	D	1
F1_solid_angle	F1 detector pixel solid angle	1.5625e-6	sr	D	1
thickness_coeff	TCWV-to-optical thickness polynomial			D	3
path_coeff	cos(zenith)-to-path correction polynomial	0; 1; 0		D	3
mir_frp_factor	Planck-to-Stefan conversion factor	1.704e-5	sr.microm	D	1
SWIR_frp_factor	Planck-to-Stefan conversion factor	9.295e-6	sr.microm	D	1
law_error	Power law conversion error	0.1		D	1
vertical_atm_transmittance_error	Vertical atmosphere transmittance uncertainty except water vapour			D	5
water_vapour_transmittance_error	Water vapour transmittance uncertainty			D	3
Confidence Tests					
c1low_day_threshold	S7 daytime low threshold (23)	310	K	D	1
c1high_day_threshold	S7 daytime high threshold (23)	340	K	D	1
c1low_night_threshold	S7 night time low threshold (29)	305	K	D	1
c1high_night_threshold	S7 night time high threshold (29)	320	K	D	1
c2low_threshold	S7 Z-score low threshold (24)	2.5		D	1
c2high_threshold	S7 Z-score high threshold (24)	6		D	1

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Format Specification**

Element name	Description	Range or value	Unit	T	C
c3low_threshold	S7-S8 Z-score low threshold (24)	3		D	1
c3high_threshold	S7-S8 Z-score high threshold (24)	6		D	1
c4low_threshold	Nc low threshold (26)	0		D	1
c4high_threshold	Nc high threshold (26)	6		D	1
c5low_threshold	Nv low threshold (26)	0		D	1
c5high_threshold	Nv high threshold (26)	6		D	1
low_threshold	Fire low confidence threshold	0		D	1
mid_threshold	Fire medium confidence threshold	50		D	1
high_threshold	Fire high confidence threshold	100		D	1

4.5 GLC2000 global mask data file

The distinction between land and sea pixels is currently based on the Global Land Cover (GCL) 2000 mask (<https://forobs.jrc.ec.europa.eu/products/glc2000/glc2000.php>). The file is in GeoTIFF tiled containing a two-dimensional array, using one byte per pixel, in a regular equidistant latitude/longitude projection. TIFF's packbits compression is used to drastically reduce the size of the file.. Note however that only Water bodies are relevant for FRP algorithm.

Table 7: Description of SLSTR L2 FRP ADF GLC2000 global mask data

FILE Type	Update rate	Size
SL_2_PLFMAX	Infrequently	417 M

Element name	Description	Range or value	T	D
<global common attributes>	Common global attributes			
flag_values	CF list of flag values	Error! Reference source not found.	uc	22
flag_meanings	CF space-separated list of flag meanings	Error! Reference source not found.	S	1

Table 8: GLC2000 Global Legend (aggregated from regional classes using Land Cover Classification System (LCCS))

Flag value	Description / flag meanings
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1	Tree Cover, broadleaved, evergreen
2	Tree Cover, broadleaved, deciduous, closed
3	Tree Cover, broadleaved, deciduous, open
4	Tree Cover, needle-leaved, evergreen
5	Tree Cover, needle-leaved, deciduous
6	Tree Cover, mixed leaf type
7	Tree Cover, regularly flooded, fresh water (& brackish)
8	Tree Cover, regularly flooded, saline water
9	Mosaic: Tree cover / Other natural vegetation
10	Tree Cover, burnt
11	Shrub Cover, closed-open, evergreen
12	Shrub Cover, closed-open, deciduous
13	Herbaceous Cover, closed-open
14	Sparse Herbaceous or sparse Shrub Cover
15	Regularly flooded Shrub and/or Herbaceous Cover
16	Cultivated and managed areas
17	Mosaic: Cropland / Tree Cover / Other natural vegetation
18	Mosaic: Cropland / Shrub or Grass Cover
19	Bare Areas
20	Water Bodies (natural & artificial)
21	Snow and Ice (natural & artificial)
22	Artificial surfaces and associated areas

4.6 Classification fire mask data file

The SLSTR L2 Classification Fire Mask Data file includes the location of industrial hotspot such as gas flares, over land and ocean surfaces, and volcanically active zones. The file is in NetCDF Format with two separate lists: the geographical locations of potential gas flares and the position of potential volcano locations.

Table 9: Description of SLSTR L2 FRP ADF classification fire mask data

FILE Type	Update rate	Size
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SL_2_CFM_AX	Infrequently	
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Element name	Description	Range or value	T	C
Volcano List				
volcano	Number of potential volcano sites	1571		
Latitude	Global Volcano Latitude	[-90,90]	fl	Volcano
units	UDUNITS unit name	degree	S	1
_Fillvalue		-999.f	s	1
Longitude	Global Volcano Longitude	[-180,180]	fl	Volcano
units	UDUNITS unit name	degree	S	1
_Fillvalue		-999.f	s	1
Gas Flare list				
gas_flare	Number of potential gas flares sites	958		
Latitude	Global Gas flare Latitude	[-90,90]	fl	Volcano
units	UDUNITS unit name	degree	S	1
_Fillvalue		-999.f	s	1
Longitude	Global Gas Flare Longitude	[-180,180]	fl	Volcano
units	UDUNITS unit name	degree	S	1
_Fillvalue		-999.f	s	1

4.7 S7 and F1 thermal pixel area data file

The SLSTR L2 Thermal Pixel Area Data file provides, for each pixel, the 2D maps of the projected Field of view on the ground. This ADF is static, available for all SLSTR channels. However only the files dedicated to S7 and F1 channel are required for Fire processing. The file is in NetCDF Format.

Table 10: Description of SLSTR L2 FRP ADF S7 & F1 thermal pixel area data file

FILE Type	Update rate	Size
SL_2_SXPAAX SL_2_FXPAAX	Infrequently	

Element name	Description	Range or value	T	D
<global common attributes>	Common global attributes			
Nadir_pixels	Number of pixels in the nadir view, across-track direction	1199		

Element name	Description	Range or value	T	D
Oblique_pixels	Number of pixels in the oblique view, across-track direction	529		
Pixel_area	Pixel Area associated with one SLSTR view and Channel			
_Fillvalue		-999.f		
units	UDUNITS unit name	Km ²		

4.8 TIR characterization data file

The SLSTR S7, S8 and F1 Thermal Infrared (TIR) Characterisation Data File are L1 auxiliary data files which contain LUTs for the conversion of brightness temperature into radiance for the S7, S8 and F1 nadir channel. They are described in more details in the Level-1 (L1) section 6.1.3 in [AD-4].

Table 11: Description of SLSTR L2 FRP ADF S7 & F1 thermal pixel area data file

FILE Type	Update rate	Size
SL_1_N_S7AX	Infrequently	0.04 MB
SL_1_N_S8AX	Infrequently	0.04 MB
SL_1_N_F1AX	Infrequently	0.04 MB