Sentinel-3 Product Notice – SLSTR Fire Radiative Power products

Mission	Sentinel-3A & Sentinel-3B	
Sensor	SLSTR-A & SLSTR-B	
Product	• Level 2: SL_2_FRP at NTC	
Product Notice ID	S3.PN-SLSTR-FRP.02	
Issue/Rev Date	19/08/2020	
Version	1.0	
Preparation	This Product Notice was prepared by the S3 Mission Performance Centre and by ESA experts	
Approval	ESA Mission Management	

Summary

This Product Notice addresses both Sentinel-3A and -3B SLSTR Fire Radiative Power (FRP) processing baselines deployed on 28/07/2020. It is applicable to Non-Time Critical (NTC) timeliness.

It corresponds to the public release of SL_2 FRP products, made on the 19th of August 2020.

The Notice describes the Level-1B current status, the processing baseline, the product quality and known limitations for both SL_FRP-A and SL_FRP-B.

Processing Baselines		
	S3A	**S3B**
Processing Baseline	• Processing Baseline: 2.70	• Processing Baseline: 1.46
IPFs version	• SL_2_FRP IPF version 01.04 • SL_1 IPF version: 06.17 • PUG version: 3.37	

Current Operational Processing Baselines		
IPF	**IPF Version**	**Into operations since**
S3A & S3B SL_2_FRP	01.04	**Land Centres:** NTC mode: 28/07/2020 08:22 UTC
S3A & S3B SL_1	06.17	**Land Centres:** NTC mode: 09/06/2020 09:57 UTC
PUG	3.37	**Land Centres:** NTC mode: 15/01/2020 09:45 UTC

Status of the Processing Baseline

The current processing baseline for SLSTR-A FRP products is v2.70 and for SLSTR-B is v1.46. The baseline was deployed in the Land processing centres on 28/07/2020 for SLSTR-A and for SLSTR-B.

The quality status of the baseline products is as follows:

Geometric Calibration

- SLSTR-A and SLSTR-B nadir and oblique view geolocation accuracy meet the mission requirements (0.5 pixel as per S3 MRTD, 2011).
- The estimated geometric validation for SLSTR-A and SLSTR-B is within 0.1 pixel in nadir view along and across track and in oblique view across track.
    - Smaller offset (still within requirements) is observed in oblique view along track (~0.2 pix) for both satellites.

TIR Radiometric Calibration

- SLSTR-A: TIR radiometric accuracy meets the mission requirements (S3 MRTD, 2011).
- SLSTR-B: TIR radiometric accuracy is under evaluation. Early results presented at the SLSTR technical In-Orbit Commissioning Review (IOCR) suggest that the calibration is compliant for the mission requirements above 250K (S3 MRTD, 2011).

VIS/SWIR Radiometric Calibration Information

- SLSTR-A/B: Currently all solar channels (S1-S6) are undergoing a vicarious calibration assessment to quantify their radiometric calibration. The calibration factors communicated in the last product notices are still valid and new estimates will be communicated in March/April 2020.

Flags

Several flags are internally processed inside the SLSTR L2 FRP algorithm/software and are not derived from SLSTR L1B products:

- The cloud masking considered in the FRP processing is based on an internal algorithm radiometry test and is different from the SLSTR L1 masking – for one reason because of the need to minimise the chances that areas of smoke are masked as cloud.
- The surface classification is derived from the Global Land Cover 2000 map.
- The sun glint risk is also internally re-evaluated and the results can differ from the one included in the SLSTR L1B Product. This internal sunglint detection test is currently under review as though it

works well in most cases there have been several times when it has failed to work and this has resulted in occasional false detections of active fires in the ocean instead of the sunglint flag being raised. This issue has been tracked down to saturation of the S2 channel radiometry over the most strongly glinting areas and a fix is currently under investigation.

Known product quality limitations

Whilst the SLSTR FRP products are considered mature enough to be released, and intercomparisons against near-contemporaneous measurements from other sensors have demonstrated their general quality, the products are still under evaluation and adjustment. Therefore all outputs included in the SLSTR FRP products should still be considered with caution. Specifically the following issues remain under investigation and/or development;

- At present the algorithm is predominantly delivering active fire detections and FRP data from night-time (ascending node) S3A and S3B overpasses. This is due to frequent instrument saturation issues in the S7 (middle infrared) channel over warm surfaces, meaning that overpasses are processed to FRP products only in regions where less than 1% of the cloud free land is recording S7 brightness temperatures greater than 311 K (i.e. are saturated or very close to saturation). Very many daytime areas in regions where active fires are burning do not meet this requirement, and as such remain unprocessed. Product evaluation has also so-far focused mainly on night-time acquisitions for this reason, almost all of which meet this requirement and so are processed to FRP products. A subsequent algorithm update will see full processing of the daytime (descending node) overpass data.
- The active fire detection tests used by the algorithm are based on three strategies, firstly an absolute threshold test using the F1 channel (middle infrared) data. Secondly a contextual threshold test based on the S7 and S8 channel (middle infrared and longwave infrared) data. And thirdly, thresholding of the S6 (shortwave infrared) channel data for oceanic gas flares detection and (by night) additional detection of land-based fires (most of which will in any case be detected by one of the other two approaches). However, this third method needs a number of refinements to work effectively and is currently disabled pending these upgrades.

  FRP is retrieved for each detected active fire pixel from the MIR band spectral radiances (which is the most appropriate method for vegetation fires), and later will be derived also from the SWIR bands over some targets once the SWIR-based active fire detection tests are activated.
- Very frequent saturation of the S7 channel over active fire pixels means that the F1 channel must often be used instead to accurately measure MIR waveband spectral radiances, but the F1 and S7 channels are not perfectly co-located. Hence the algorithm includes the strategy of clustering spatially contiguous active fire pixels into individual fires (each composed of a cluster of active fire pixels) to cope with this fact. There is a switch within the algorithm that defines whether the active fire pixel FRP retrievals within each individual fire are all calculated using the F1 data, or whether those fires that contain only unsaturated S7 pixels still have their per-pixel FRPs retrieved using the S7 data (these options are termed F1_ON or F1_OFF respectively). After a period of testing,

intercomparison and evaluation against independent measurements, the first situation (F1_ON) has been shown to deliver better product performance and is the one implemented to produce the operational NTC FRP products.

- The AF pixel detection "confidence" parameter is not yet properly calibrated for use with SLSTR data, so this value should not be used at present. Many of the active fire pixel confidences are currently reporting zero values for example. The product does however include an estimate of the uncertainty on the FRP retrievals made using the MIR band signals.
- In addition to the sunglint issue mentioned in the previous section and which is caused by occasional S2 channel saturation resulting in false active fire detections over very intense ocean sunglints, there are some rare instances where the F1 channel shows very high brightness temperatures that are not representative of real environmental conditions (generally downscan of very cold clouds) – and this may also have the potential to trigger false active fire detections.

Products Availability

☒ Copernicus Open Access Hub (https://scihub.copernicus.eu/), NRT and NTC

☐ Copernicus Online Data Access (https://coda.eumetsat.int/), NRT and NTC

☐ EUMETCast (https://eoportal.eumetsat.int/), NRT

☐ EUMETSAT Data Centre (https://eoportal.eumetsat.int/), NRT and NTC

☐ Other

Any other useful information

- None

User Support

- Questions about SLSTR products can be asked to the Sentinel-3 User Support desk at:
  - eosupport@copernicus.esa.int

References

- SLSTR L1 Product Notice
  - S3.PN.SLSTR-L1.07, v1.0 dated on 15/01/2020
- Product Data Format Specification – SLSTR Level 1 & 2 Instrument Products, Ref: S3IPF.PDS.005.1, Issue: 2.7, Date: 06/02/2018

https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-slstr/document-library

Static ADFs

S3A

- S3__SL_2_CFM_AX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3__SL_2_PLFMAX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3A_SL_2_FRPTAX_20160216T000000_20991231T235959_20191115T120000_____MPC_O_AL_003.SEN3
- S3A_SL_2_FXPAAX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3A_SL_2_PCPFAX_20160216T000000_20991231T235959_20200708T120000_____MPC_O_AL_004.SEN3
- S3A_SL_2_S6N_AX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3A_SL_2_SXPAAX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3A_SL_1_N_F1AX_20160216T000000_20991231T235959_20170324T120000_____MPC_O_AL_006.SEN3
- S3A_SL_1_N_S7AX_20160216T000000_20991231T235959_20170324T120000_____MPC_O_AL_006.SEN3
- S3A_SL_1_N_S8AX_20160216T000000_20991231T235959_20170324T120000_____MPC_O_AL_006.SEN3
- S3A_SL_2_S7N_AX_20000101T000000_20991231T235959_20151214T120000_____MPC_O_AL_001.SEN3
- S3A_SL_2_F1N_AX_20000101T000000_20991231T235959_20151214T120000_____MPC_O_AL_001.SEN3

S3B

- S3__SL_2_CFM_AX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3__SL_2_PLFMAX_20160216T000000_20991231T235959_20190930T120000_____MPC_O_AL_002.SEN3
- S3B_SL_2_FRPTAX_20180425T000000_20991231T235959_20191115T120000_____MPC_O_AL_002.SEN3
- S3B_SL_2_FXPAAX_20180425T000000_20991231T235959_20190930T120000_____MPC_O_AL_001.SEN3
- S3B_SL_2_PCPFAX_20180425T000000_20991231T235959_20200708T120000_____MPC_O_AL_003.SEN3
- S3B_SL_2_S6N_AX_20180425T000000_20991231T235959_20190930T120000_____MPC_O_AL_001.SEN3
- S3B_SL_2_SXPAAX_20180425T000000_20991231T235959_20190930T120000_____MPC_O_AL_001.SEN3
- S3B_SL_1_N_F1AX_20180425T000000_20991231T235959_20181002T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_N_S7AX_20180425T000000_20991231T235959_20190912T120000_____MPC_O_AL_003.SEN3

- S3B_SL_1_N_S8AX_20180425T000000_20991231T235959_20180409T120000_____MPC_O_AL_001.SEN3
- S3B_SL_2_S7N_AX_20180425T000000_20991231T235959_20180409T120000_____MPC_O_AL_001.SEN3
- S3B_SL_2_F1N_AX_20180425T000000_20991231T235959_20180409T120000_____MPC_O_AL_001.SEN3

End of the Product Notice