Sentinel-3 Product Notice – SLSTR

Mission	Sentinel-3A & Sentinel-3B	
Sensor	SLSTR-A & SLSTR-B	
Product	• Level 1B: SL_1_RBT at NRT and NTC	
Product Notice ID	S3.PN-SLSTR-L1.06	
Issue/Rev Date	07/11/2018	19/11/2018
Version	1.1	
Preparation	This Product Notice was prepared by the S3 Mission Performance Centre and by ESA and EUMETSAT experts	
Approval	Joint ESA-EUM Mission Management	

Summary

This Product Notice addresses both Sentinel-3A and -3B Sea and Land Surface Temperature Radiometer (SLSTR-A and SLSTR-B) Level-1B processing baselines deployed on 02/08/2018 for SLSTR-A and 15/10/2018 for SLSTR-B. It is applicable to Near Real Time (NRT) and Non-Time Critical (NTC) timeliness.

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

The main change to the previous release of this product notice is related to the public release of Sentinel-3B SLSTR Level-1B.

Processing Baselines		
	S3A	**S3B**
Processing Baseline	• Processing Baseline: 2.37	• Processing Baseline: 1.12
IPFs version	• SL_1 IPF version: 06.16 • PUG version: 3.35	

Current Operational Processing Baselines		
IPF	**IPF Version**	**Into operations since**
S3A SL1	06.16	**Land Centres:** NRT mode: 02/08/2018 10:01 UTC NTC mode: 02/08/2018 10:01 UTC **Marine Centre:** NRT mode: 02/08/2018 10:01 UTC NTC mode: 02/08/2018 10:01 UTC
S3B SL1	06.16	**Land Centres:** NRT mode: 12/11/2018 10:00 UTC NTC mode: 19/11/2018 10:00 UTC **Marine Centre:** NRT mode: 12/11/2018 10:00 UTC NTC mode: 19/11/2018 10:00 UTC
PUG	3.35	**Land Centres:** NRT mode: 12/06/2018 10:15 UTC NTC mode: 12/06/2018 10:15 UTC **Marine Centre:** NRT mode: 12/06/2018 10:15 UTC NTC mode: 12/06/2018 10:15 UTC

Status of the Processing Baseline

The current processing baseline for SLSTR-A Level-1B products is v2.37 and for SLSTR-B is v1.08. The baseline was deployed in the Land and Marine processing centres on 02/08/2018 for SLSTR-A and 15/10/2018 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: SLSTR-A ~ -0.3 pix and SLSTR-B ~ -0.2 pix.

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: Channels S1-S3 are in line with the corresponding OLCI and AATSR channels and meet the mission requirements (S3 MRTD, 2011). The radiometric calibration for S4 to S6 is not nominal[1].
- SLSTR-B: The SLSTR-B channels S1-S6 have been radiometrically aligned for the moment to those of SLSTR-A. The status of SLSTR-A VIS/SWIR is applicable to SLSTR-B with additionally observed gain instability of channels S1 and S2 (~2-3%) and residual non-linearity compared to SLSTR-A (below 3%).

[1] See details in section VIS/SWIR Radiometric Calibration Information in page 5


Bayesian/probabilistic cloud screening

- SLSTR-A validation of the Bayesian and Probabilistic cloud mask indicates an overall accuracy of up to 90%. Although there is a significant improvement compared to the basic cloud mask, there are still some identified residual issues.
- The ECMWF updates implemented in PB 2.37 result in improvements to the quality of the Bayesian cloud mask in coastal and inland water areas.
- This status is also applicable to SLSTR-B.

Basic cloud screening

- SLSTR-A and SLSTR-B summary_cloud:
  - The results of the remaining cloud test (thermal histogram) is not taken into account in the cloud word. The results of this test is however still available in the individual cloud test bits in the cloud_flags.

Flags

SLSTR-A and SLSTR-B:

- Radiance/BT out of range flags are nominal.
- Saturation flags (where the uncalibrated counts are out of their expected range) are nominal.
- Pointing flags are nominal.

Meteorological fields

- Soil wetness name corrected.
- Error in input latitude grid corrected.

Known product quality limitations

SLSTR-A Level-1B processing baseline v2.37 and SLSTR-B Level-1B PB 1.12 has the following known limitations, unless explicitly mentioned all points are applicable to both SLSTR-A and SLSTR-B:

VIS/SWIR Radiometric Calibration Information

- The radiometric calibration of SLSTR-A and SLSTR-B S1-S3 channels in the nadir view shows that it is within ±1% of the corresponding channels on OLCI. Analysis for S5 and S6 show that there is a discrepancy of approximately 12% (±2%) and 20% (±10%) respectively. However, to avoid impacting the operational cloud screening the calibration adjustments have not been implemented in the processing baseline.
- Based on the analysis performed to-date, a recommendation has been put forward to users to adjust the S5 and S6 reflectances by factors of 1.12 and 1.20 respectively in the nadir view and 1.15 and 1.26 in the oblique view. Uncertainty estimates on these differences are still to be evaluated and comparisons with other techniques have yet to be included.
- These corrections should be used with caution as it is possible that the differences are scene dependent.
- The root cause of the discrepancy has not yet been determined, but is under investigation.

S7, S8, S9 co-registration

- A sub-pixel mis-registration of S7 with regard to S8 and S9 of ~ 250 m for SLSTR-A and ~120 m for SLSTR-B has been detected and is being investigated.

Fire Channel Co-Registration

- Inspection of SLSTR L1 products has shown a significant spatial offset of the 3.7 µm F1 channel compared to the corresponding S7 channel. The cause of the mis-registration is due to the specific detector geometry of F1. A solution to improve the geometric calibration of F1 is under investigation. Users should be aware that because of the specific detector geometry of F1, the pointing and pixel IFOV is not identical to S7 so point sources (i.e. gas flares) will not necessarily occupy the same image pixel.

Regridding

- L1 products are regridded using a nearest neighbour algorithm that places the first instrument pixel that lies within an image pixel. Other instrument pixels that would provide a better match are not used and saved as orphan pixels. Also, the algorithm uses information from a synthetic tie-point grid which is georeferenced to the geoid and does not take into account the surface elevation. This approach was adopted to achieve the required processing speed for NRT production. Consequently images over land are shifted w.r.t. the image grid coordinates. This leads to an apparent mis-registration of nadir and oblique view images. An algorithm to provide an improved regridding using the true nearest neighbour and using the ortho-geolocation information is under development. In the meantime, users are advised to use the ortho-geolocation information, which takes into account the surface elevation, that is provided in the geodetic and cartesian datasets for the appropriate image grid. E.g. for the dataset 'S1_radiance_an.nc' use 'geodetic_an.nc' and 'cartesian_an.nc' to obtain the latitudes, longitudes, along-track distance, across-track distance and surface elevation.

Meteorological fields

- Meteorological fields are nominal. Users are advised that the times given for meteorological fields are synoptic and the data has not been interpolated to SLSTR time.

Upper temperature limit of channel S7

- Upper temperature limit for channel S7 is set to ~305 K for SLSTR-A and ~311 K for SLSTR-B.
  - SLSTR-B S7 temperature values between 305 K and 311 K are not optimally calibrated but are needed for the fire radiative power algorithm.
- Users should be aware of this limitation when using SLSTR-B S7 temperatures above 305 K.

Low temperature limit of channel S8

- On 25.01.2018, the minimum brightness temperature limit for SLSTR-A channel S8 has been changed from ~205 K to ~180 K while keeping the upper limit.
- The similar minimum brightness temperature limit (~180 K) is defined for SLSTR-B.

Differences between NRT and NTC products

- There are small expected differences between NRT and NTC products due to the regridding algorithm.

Bayesian/probabilistic cloud screening

- Although there is a significant improvement compared to the basic cloud mask, some residual issues have been identified:
  - The false alarm rate is higher than would be desired indicating some over-flagging of clear sky as cloud.
  - The Bayesian cloud mask is sensitive to ocean fronts resulting in over-flagging along the front itself.
  - The Bayesian cloud mask is sensitive to surface reflectance resulting in over-flagging in regions of upwelling and coastal zones.
- The Bayesian cloud mask is provided as a probability (0 – 1) in the L1 product. A threshold of 0.1 (values less than) is used to identify clear sky pixels. However, users may wish to try different thresholds in their regions of interest by using the provided probabilities.
- The probabilistic cloud mask does not currently provide probabilities over land, only flag information. Including probabilities also over land are considered as future evolution.

Basic Cloud Screening

- Overall the cloud screening (summary_cloud) did not change since the previous SLSTR-A baseline but there are some remaining issues:
- Under-flagging of fog and low stratus over ocean
- Over-flagging of fog and low stratus over land
- Over-flagging of 1.6 large-scale histogram test near the coastline
- Different cloud masking criteria for sun glint and outside of sun glint area can cause artificial striping in the summary cloud screening

Alignment of Tie-point grids and image grids

- Due to continuity requirement, the first SLSTR tie point row has been defined over the ANX position. However, this leads to a misalignment between tie and image rows in the along-track direction. This misalignment can be evaluated by an arbitrary offset between the image grid and the tie point grid.
- Users should be aware that there are exactly the same number of tie point rows as 1km image rows.
- However, operational (PUG) products may have an additional row of 0.5 km pixels before the tie point grid that is not present in the reprocessed (IPF) products.

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

☐ FTP server address login: login password: password

☐ Other

Product	EUMETCast	ODA*	CODA**	EUMETSAT Data Centre
L1B		NRT, NTC	NRT, NTC	NRT, NTC

*** ODA** is available only for Copernicus Services and S3VT users
**** CODA** is the Copernicus Online Data Access service and is available to all users.

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
  - ops@eumetsat.int

References

- 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
  https://www.eumetsat.int/website/home/Data/TechnicalDocuments/index.html

Updated Static ADFs

- S3A_SL_1_PCP_AX_20160216T000000_20991231T235959_20180712T120000_____MPC_O_AL_011.SEN3
- S3B_SL_1_GEC_AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NAS4AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NAS5AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NAS6AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NBS4AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NBS5AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_NBS6AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_N_S1AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_N_S2AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_N_S3AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_OAS4AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
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- S3B_SL_1_OBS6AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_F2AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S1AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S2AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S3AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S7AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S8AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_O_S9AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3
- S3B_SL_1_PCP_AX_20180425T000000_20991231T235959_20180712T120000_____MPC_O_AL_002.SEN3

End of the Product Notice