



Sentinel-3A Product Notice – SLSTR Level-2 Sea Surface Temperature

Mission	Sentinel-3A	
Sensor	SLSTR	
Product	Level 2 Sea Surface Temperature	
Product Notice ID	EUM/OPS-SEN3/DOC/19/1049976	S3A.PN-SLSTR-L2M.005
Issue/Rev Date	15/01/2019	
Version	1.0	
Preparation	This Product Notice was prepared by EUMETSAT with assistance from the S3 Mission Performance Centre	
Approval	EUMETSAT Mission Management	

Summary
<p>This is a Product Notice (PN) for Sentinel-3A Sea and Land Surface Temperature Radiometer (SLSTR-A) Reprocessed Non-time Critical (R-NTC) Level-2 Sea Surface Temperature (SST) products as part of SLSTR-A Collection 003. The PN describes the SLSTR-A processing baseline relevant to Sea Surface Temperature, product quality and limitations, and product availability.</p> <p>Reprocessed NTC products are distinguished from operational NTC products by the letter R instead of the letter O in the platform field in the SLSTR SAFE format filename.</p>



Processing Information

Processing baseline	<ul style="list-style-type: none"> • L1 IPF Processing Baseline: 2.29 • L2 IPF Processing Baseline: 2.33
IPF Versions	<ul style="list-style-type: none"> • L1 IPF version: SL1 06.15 • L2 IPF version: SL2 06.14 • PUG version: 03.34

Time Period of Reprocessing

First Products	S3A_SL_2_WST____20160418T235716_20160419T013515_20180927T170710_5878_003_144_____MR1_R_NT_003.SEN3
Last Products	S3A_SL_2_WST____20180404T225043_20180405T000012_20180929T080421_4168_029_343_____MR1_R_NT_003.SEN3



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Status of the Processing Baseline

This PN covers reprocessed SLSTR-A Level-2 Sea Surface Temperature products generated using processing baseline v2.33 as part of SLSTR-A Collection 003. The quality status of the baseline products is as follows.

Level 1 Products:

Geometric Calibration

- SLSTR-A nadir and oblique view geolocation accuracy meet the mission requirements (0.5 pixel as per S3 MRTD, 2011).

TIR Radiometric Calibration

- SLSTR-A TIR radiometric accuracy meets the mission requirements (S3 MRTD, 2011).

Cloud screening

- A new cloud mask using Bayes theorem to identify clear sky scenes has been introduced for this product release.

Level 2 Products:

SST retrieval algorithm (WST)

- The uncertainties of individual pixel clear-sky SST meet mission requirements (better than ± 0.3 K) for all retrievals for Quality Level 5 data.
- It is recommended to only use the dual-view part of the SLSTR swath for reference SST applications.
- It is suggested to only use Quality Level 5 data.
- The current SSES for quality levels lower than 5 are not well prescribed and will be updated after the next reprocessing.
- User applications that can accept lower quality data may wish to use data with Quality Level lower than 5 or apply their own threshold on the Bayesian cloud probability (see later). However, users should never use Quality Level 4 D2 or D3 data.
- The current algorithm implementation interpolates SST coefficients to the tie point grid before the image grid.

Bayesian cloud screening

- A Bayesian cloud detection has been implemented over sea. Cloud detection is based on calculating a probability of clear-sky of each pixel based on the satellite observation, prior information about the atmosphere and surface conditions and the respective uncertainties in these variables. Current implementation is using European Centre for Medium-range Weather Forecasting (ECMWF) NWP data as input to simulate clear sky brightness temperatures and top of the atmosphere reflectances. The radiative transfer model used for simulating brightness temperatures is RTTOV. The probabilities have been included as experimental fields in the L2P WST product, are used to derive the Quality Levels, and are used for the cloud flag instead of the previously used basic cloud screening.



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SST attributes (WST)

- The SST scale_factor and add_offset values have been modified to be in line with those used by the Group for High Resolution Sea Surface Temperature (GHRSSST).
- There has been a modification to the “long_name” attribute value of the WST sea_surface_temperature variable.

Treatment of missing Level 0 or Level 1 data

- Missing Level 2 data can occur for a number of reasons, including missing Level 0 data (no data received from spacecraft) or missing Level 1 data (data received but not processed to higher order products, e.g. during a spacecraft manoeuvre where the geolocation is compromised).
- These occurrences are included in real time (NRT) and non time critical (NTC) SLSTR-A products. However, they are not included in the reprocessed data that forms part of SLSTR-A Collection 003. Full orbit Level 2 products, as a consequence, may occasionally have discontinuities in them where ordinarily the affected data would occur.
- The number of affected products is small and mainly occurs in the period from April 2016 to September 2016 during the instrument commissioning period.
- The scientific quality of the data is not compromised and you will only notice this effect if you view products in raster image processing tools such as SNAP. If you use your own tools and/or exploit time and geolocation information to view the products then they will appear nominal.

Known Product Quality Limitations

SLSTR-A Level-1b Processing Baseline 2.29 has the following known limitations relevant to Sea Surface Temperature:

Geometric Calibration Model

- SLSTR-A nadir view geolocation and co-registration to the oblique view has been improved. Current estimates (using robust statistics) for nadir view are -0.12 ± 0.03 (rms: 0.13) pixel across-track and -0.03 ± 0.04 (rms: 0.05) in the along-track. The oblique view geolocation is currently estimated at approximately -0.15 ± 0.09 (rms: 0.17) pixel across-track and -0.45 ± 0.12 (rms: 0.47) pixel along-track. Further improvement in oblique view is expected.
- S7, S8, s9 co-registration
- A small sub-pixel mis-alignment has been observed between S7 and co-registered S8/S9 pixels (~250 m).
- For SST, the impact is still being assessed but is estimated to be very small ($\ll 0.1$ K) and less than any uncertainty introduced by errors in the geolocation calibration model.



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Bayesian Cloud Screening

- A new cloud mask using Bayes theorem to identify clear sky scenes has been introduced for this product release. Validation of the cloud mask indicates an overall accuracy of 90%. Although a significant improvement compared to the previous 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 SLSTR-A WST files. A threshold of 0.1 (i.e. values less than) is used to identify clear sky pixels and for assigning the WST Quality Levels. However, users may wish to try different thresholds in their regions of interest by using the provided probabilities.

SLSTR-A Level-2 SSTs with Processing Baseline 2.33 have the following known limitations:

SST retrieval

- The SST retrieval coefficients for nadir-only cases (N2 and N3) require further optimisation.
- The SST retrieval coefficients have been updated to adjust for inter-algorithm biases between the different SST algorithm types (N2, N3, D2 and D3). However, small offsets may still be most noticeable at the edges of the oblique-view where the retrieval changes between combined-view and single-view.

WST theoretical uncertainties

- The SST theoretical uncertainties are still preliminary and require further optimisation. Small offsets will be seen between the different SST algorithm types (N2, N3, D2 and D3). These offsets will be most noticeable at the edges of the oblique-view where the retrieval changes between combined-view and single-view.

WST SSES bias and standard deviation

- The WST SSES bias and standard deviation values have been updated for this release. Values are provided for each retrieval and Quality Level. Users are reminded to apply the SSES bias before using the data. The SSES bias and standard deviation values will be refined in future updates. In particular, the SSES for Quality Levels lower than 5 are not currently well prescribed.

WST quality levels

- The quality levels have been updated in this product release. For the best quality sea surface temperature observations, it is recommended to use only Quality Level 5 data. However, users should never use Quality Level 4 D2 or D3 data.



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WST S7, S8, and S9 NeDT values

- The pixel level NeDT values for channels S7, S8 and S9 provided in the WST display small pixel to pixel variability owing to the instrument design. Each of the channels has two detectors, with each detector having two integrators (for S8 and S9). A checkerboard pattern is seen that varies every 20 rows (or 120 instrument scans), which corresponds to the calibration averaging window used to calculate the gains and offsets for each detector. Occasional missing values in the scanline pattern.

WST inland water

- SSTs and auxiliary fields are provided for inland water bodies as well as open ocean. These values should be considered very preliminary awaiting further validation. Please use l2p_flags (bit 4, lake) to remove all inland pixels if not required. Note that bit 5, river, is not yet utilized and rivers are currently masked as lakes.

Product Availability

- Copernicus Online Data Access (<https://coda.eumetsat.int/>), NRT and NTC
- Copernicus Online Data Access (<https://codarep.eumetsat.int/>), REP
- 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**	CODA REP***	EUMETSAT Data Centre
L2 SST				REP	

* **ODA** is available only for Copernicus Services and S3VT users

** **CODA** is the Copernicus Online Data Access and is available to all users

*** **CODA REP** is the Copernicus Online Data Access for Reprocessing and is available to all users

SLSTR Collection 3

The data covered by this PN are part of SLSTR Collection 003. The SLSTR collection number is included in the SAFE format filename. Reprocessed NTC products are distinguished from operational NTC products by the letter R instead of the letter O in the platform field in the SLSTR SAFE format filename. The user is referred to the SLSTR Marine Product Handbook for further information.



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To form a consistent Collection 003 SST dataset users are advised to use operational NTC timeliness data along with the reprocessed data:

NTC time period and first/last products from each processing baseline

Product Notice

04/04/2018-01/08/2018 (first/last **O-NTC** products):

S3A_SL_2_WST____20180404T225052_20180405T003151_20180406T073955_6059_029_343____MAR_O_NT_003.SEN3
S3A_SL_2_WST____20180731T233157_20180801T011256_20180802T102422_6059_034_101____MAR_O_NT_002.SEN3

S3A PN-SLSTR-L2M-
03 - i1r0 - SLSTR
L2M

01/08/2018 – onwards (first **O-NTC** product):

S3A_SL_2_WST____20180801T011256_20180801T025355_20180802T183608_6059_034_102____MAR_O_NT_002.SEN3

S3A PN-SLSTR-L2M-
04 - i1r0 - SLSTR
L2M

However, if users prefer to use NRT timeliness to complete their Collection 003 record, they should use the following operational NRT products:

NRT time period and first/last products from each processing baseline

Product Notice

04/04/2018-02/08/2018 (first/last **O-NRT** product):

S3A_SL_2_WST____20180404T235806_20180405T000106_20180405T015916_0179_029_344_2520_MAR_O_NR_003.SEN3
S3A_SL_2_WST____20180802T080759_20180802T081059_20180802T103929_0179_034_121_0720_MAR_O_NR_002.SEN3

S3A PN-SLSTR-L2M-
03 - i1r0 - SLSTR
L2M

02/08/2018 – onwards (first **O-NRT** product):

S3A_SL_2_WST____20180802T081059_20180802T081359_20180802T103932_0179_034_121_0900_MAR_O_NR_002.SEN3

S3A PN-SLSTR-L2M-
04 - i1r0 - SLSTR
L2M

Note: Due to an anomaly, filenames of operational products between 12.06.2018 and 03.09.2018 were marked with baseline collection 002, instead of 003.

References

- Sentinel-3 Mission Requirements Traceability Document (MRTD), C. Donlon, EOP-SM/2184/CD-cd, 2011.
<https://sentinel.esa.int/documents/247904/1848151/Sentinel-3-Mission-Requirements-Traceability>
- 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>
- Sea Surface Temperature (SLSTR) Algorithm Theoretical Basis Document (ATBD) SLSTR-ATBD-L2SST-v2.5
<https://www.eumetsat.int/website/home/Data/TechnicalDocuments/index.html>
- Further information and documentation can be found at:
<https://www.eumetsat.int/website/home/Satellites/CurrentSatellites/Sentinel3/SeaSurfaceTemperatureServices/index.html>



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End of Product Notice