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

Mission	Sentinel-3B
Sensor	SLSTR
Product	Level-2 Sea Surface Temperature

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Version	1.1	
Preparation	This Product Notice was prepared by EUMETSAT with assistance from the S3 Mission Performance Centre	
Approval	EUMETSAT Mission Management	

Summary

This is a Product Notice (PN) for a preliminary release of Sentinel-3B Sea and Land Surface Temperature Radiometer (SLSTR-B) Level-2 Sea Surface Temperature (SST) products for the Sentinel-3 Validation Team (S3VT) and expert users only. The PN is applicable to Near Real Time (NRT) and Non Time Critical (NTC) production, describes the SLSTR-B processing baseline relevant to SST, and summarises product quality, limitations and availability.

Preliminary SLSTR-B SST products are made available for evaluation and validation only. Use in real-time operational systems or further redistribution is not advised.

Processing Information

Processing baseline	• L1 IPF Processing Baseline: 1.12
	• L2 IPF Processing Baseline: 1.8
IPF Versions	• L1 IPF version: SL1 06.16
	• L2 IPF version: SL2 06.15
	• PUG version: 03.35

Current Operational Processing Baseline

IPF	IPF Version	In operation since (creation date)
SL1	06.16	NRT mode: 02/08/2018 10:01 UTC NTC mode: 02/08/2018 10:01 UTC
SL2	06.15	NRT mode: 02/08/2018 10:01 UTC NTC mode: 02/08/2018 10:01 UTC
PUG	03.35	NRT mode: 12/06/2018 10:24 UTC NTC mode: 12/06/2018 10:24 UTC

Status of the Processing Baseline

The current processing baseline for SLSTR-B Level-2 Sea Surface Temperature products is v1.8, as deployed in the Marine Centre on 2nd August 2018. The quality status of the baseline products is as follows:

Level-1B Products:

Geometric Calibration

- 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-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 of ~ -0.2 pix.

TIR Radiometric Calibration

- TIR Radiometric Calibration
- SLSTR-B TIR radiometric accuracy is under evaluation. Early results presented at the SLSTR-B 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

- The SLSTR-B channels S1-S6 have been radiometrically aligned provisionally to those of SLSTR-A. SLSTR-A and -B channels S1-S3 are in line with the corresponding OLCI and AATSR channels and meet the mission requirements (S3 MRTD, 2011). Radiometric calibration for S4 to S6 is not nominal. There is an additional observed gain instability of SLSTR-B channels S1 and S2 (~2-3%) and residual non-linearity compared to SLSTR-A (below 3%).

Bayesian/probabilistic cloud screening

- 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.

Basic cloud screening

- The results of the thermal histogram cloud test is not taken into account in the summary_cloud word. The results of this test is however still available in the individual cloud test bits in the cloud_flags.

Flags

- 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.

Level-2 Products:

SST retrieval algorithm (WCT and WST)

- The current SST retrieval algorithm is preliminary and initially uses retrieval coefficients developed for Sentinel-3A SLSTR owing to the high degree of commonality in the spectral response functions of the two instruments. SLSTR-B specific coefficients will be implemented in a future update. Initial validation statistics against drifting buoys indicate that the SLSTR-B SST bias is < 0.1K for all retrievals, and standard deviations are in line with expectations.

Known Product Quality Limitations

Sentinel-3B SLSTR **Level-1B** with Processing Baseline 1.12 has the following limitations relevant to Sea Surface Temperature:

S7, S8, S9 co-registration

- Analysis performed by the MPC suggest that there is a sub-pixel mis-registration of S7 wrt S8 and S9 of ~120 m for SLSTR-B.

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.

Differences between NRT and NTC products

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

Upper brightness temperature limit of channel S7

- The upper brightness temperature limit for channel S7 is set to ~311 K for SLSTR-B.
  - SLSTR-B S7 brightness 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 brightness temperatures above 305 K.

Sentinel-3B SLSTR **Level-2 SSTs** with Processing Baseline 1.8 have the following known limitations:

SST retrieval

- The SST retrieval coefficients are preliminary and require further optimisation.

Invalid N3 and D3 SST retrievals

- Invalid N3 and D3 retrievals will be found in WCT products where the S7 brightness temperature is in the range 305 K to 311 K. These instances will nearly all be found in daytime data and cannot be identified from the WCT product alone. The WST product is not affected as it only contains the best quality retrieval for each pixel.

WST theoretical uncertainties

- SST theoretical uncertainties are preliminary and require further optimisation.

WST SSES bias and standard deviation

- Values are provided for each retrieval and Quality Level. Users are reminded to apply the SSES bias before using the data and that application of the SSES bias maintains SST_{skin} as the measurement depth. The SSES bias and standard deviation values are preliminary. In particular, the SSES for Quality Levels lower than 5 are not currently well prescribed.

WST quality levels

- For the best quality sea surface temperature observations, it is recommended to use only Quality Level 5 data. Quality Level 4 D2 or D3 data should not currently be used for any application.

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. There are 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

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

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

☒ ODA   For access please contact ops@eumetsat.int and provide your S3VT project ID

☐ Other

Product	EUMETCast	ODA*	CODA**	EUMETSAT Data Centre
L2 SST		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

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

  Further information and documentation can be found at:
  https://www.eumetsat.int/website/home/Data/Sentinel3Services/SeaSurfaceTemperature/index.html

Updated Static ADFs

- None

End of Product Notice