



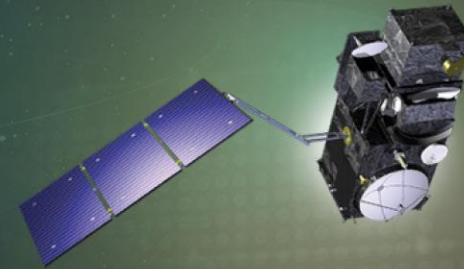
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SLSTR Product Status & Outlook



7th Sentinel-3 Validation Team Meeting 2022

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy

Anne O'Carroll & Steffen Dransfeld
EUMETSAT, ESA/ESRIN

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SLSTR Operational Processing Baselines

Since 18-May-2021 PB 2.75/1.53 for S3A/B:

- Improving of manoeuvre processing and filtering ensuring nominal geolocation just outside of manoeuvres and better flagging to allow easily identifying products acquired during manoeuvres

Since 14-June-2021 PB 2.77/1.55 for S3A/B:

- SLSTR L2 LST 6-component uncertainty implementation and improved snow masking based on NSIDCC daily snow maps.

Since 9-Feb-2022 (ESA) and 18-Jan-2022 (EUMETSAT) PBs SL__L1_.004.04.00 & 9-Feb-2022 SL__LST.004.06.00

- SLSTR L1 IPF switch to deactivate the probabilistic/Bayesian cloudmasks, PB identifier in manifest
- Transfer of Probabilistic & Bayesian Cloudmasks to L2 LST & SST IPFs

All info available on SentinelOnline and EUMETSAT webpages.



SLSTR L1 Plans

- Implementation of the improved Landmask transfer function into the operational L1 IPF
- Implementation of the improved basic cloudmask tests into the operational L1 IPF
- Currently a prototyping activity ongoing to improve the quality control for products allowing users to screen more easily for degraded products.
- Further prototyping activity of more improvements of the basic cloudmask planned in future
- Further prototyping activity to flag overshooting of the F1 channel for flagging degraded pixels
-> Users: be aware of abnormal too cold / too hot F1 BT pixels next to cold (clouds) / hot (fires) targets systematically in the scan direction.



SLSTR Prototype Evolutions

SLSTR L1 Landmask Transfer Function Improvement

- The current SLSTR surface classification masks are generated based on the location of the pixel centre rather than taking into account the full field of the pixel. By taking into account all vertices of the pixels of the pixels field of view, the classification algorithm provides more representative mask. -> Poster by Caroline Cox

SLSTR L1 Basic Cloudmask Evolution for several sub-tests:

- Better glint detection and improved cloud masking in glint areas
- New 2.25um cloud test to implement a simple threshold test over dark ocean areas where clear-sky signals are very low
- Improved VIS cloud test over land making use of a S2 & S3 ratio and biome dependent thresholds
- Improved Fog/low stratus test based on BT difference between S7 & S8 and biome dependent thresholds -> Oral presentation by Caroline Cox



VIS/SWIR calibration corrections

Nadir View

	S1	S2	S3	S5	S6
Correction	0.97	0.98	0.98	1.11	1.13
Uncertainty	0.03	0.02	0.02	0.02	0.02
Input Analysis	UoAz Rayference CNES	UoAz MPC (RAL) Rayference CNES	UoAz MPC (RAL) Rayference CNES	UoAz MPC (RAL) Rayference CNES	UoAz MPC (RAL) Rayference CNES

Oblique View

	S1	S2	S3	S5	S6
Correction	0.94	0.95	0.95	1.04	1.07
Uncertainty	0.05	0.03	0.03	0.03	0.05
Input Analysis	Rayference CNES	MPC (RAL) Rayference CNES	MPC (RAL) Rayference CNES	MPC (RAL) Rayference CNES	Rayference CNES

Note: Uncertainty estimates are at k=1.

See presentations by Dave Smith and Camille Desjardins in Joint Optical Session

Version 3.0 of the document available from Sentinel online (<https://bit.ly/3fJoaQ2>) and <https://www.eumetsat.int/sea-surface-temperature-resources>

Valid for SLSTR-A and SLSTR-B

Not applied to the L1 product to L2 users must apply these coefficients within their own processing

$$L1_Radiance_Corrected = L1_Radiance \times Adjustment_Factor$$

These are the same corrections as communicated at the last meeting, however, there are also **new long-term drift corrections available**

Feedback welcome



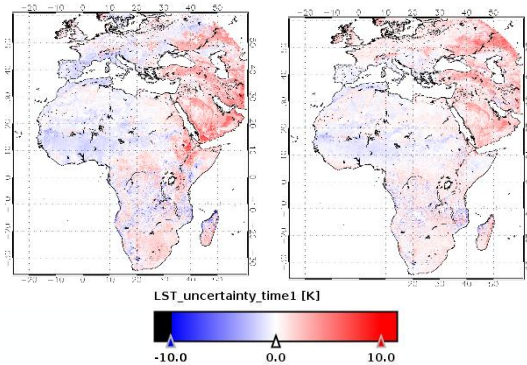
SLSTR L2 LST Status

L2 LST PB -> SL__LST.004.07.00

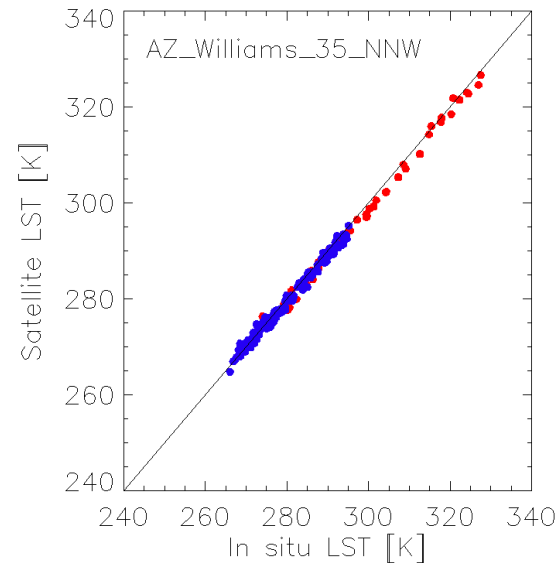
Throughout the different validation sites LST is demonstrating to be within 1K accuracy requirement for both A & B

- Intercomparison with SEVIRI LST from LSA SAF shows that products are comparable within their uncertainty range

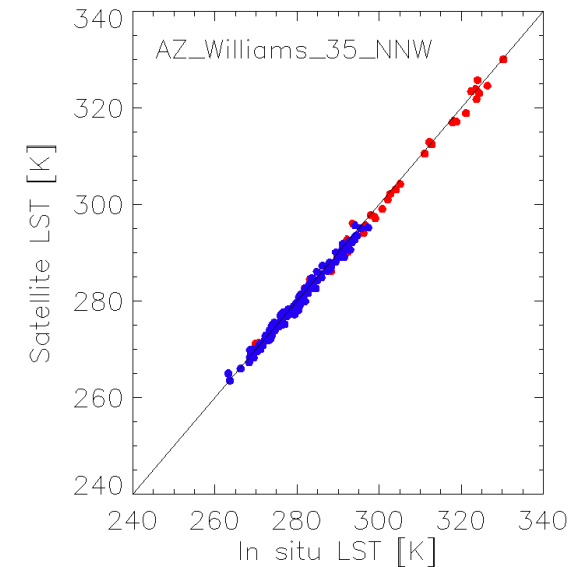
S3 A&B vs SEVIRI Feb 2020 Daytime



S3A



S3B



USCRN – Williams

Full status of validation -> D. Ghents Presentation

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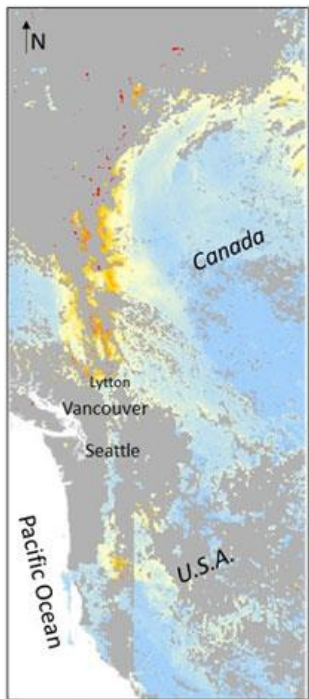


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Fire Radiative power from Lytton fires June 2021

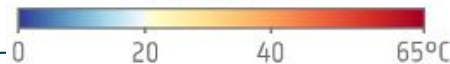
LST, NTC FRP and NTC AOD from heatwave and fires in Canada June 2021



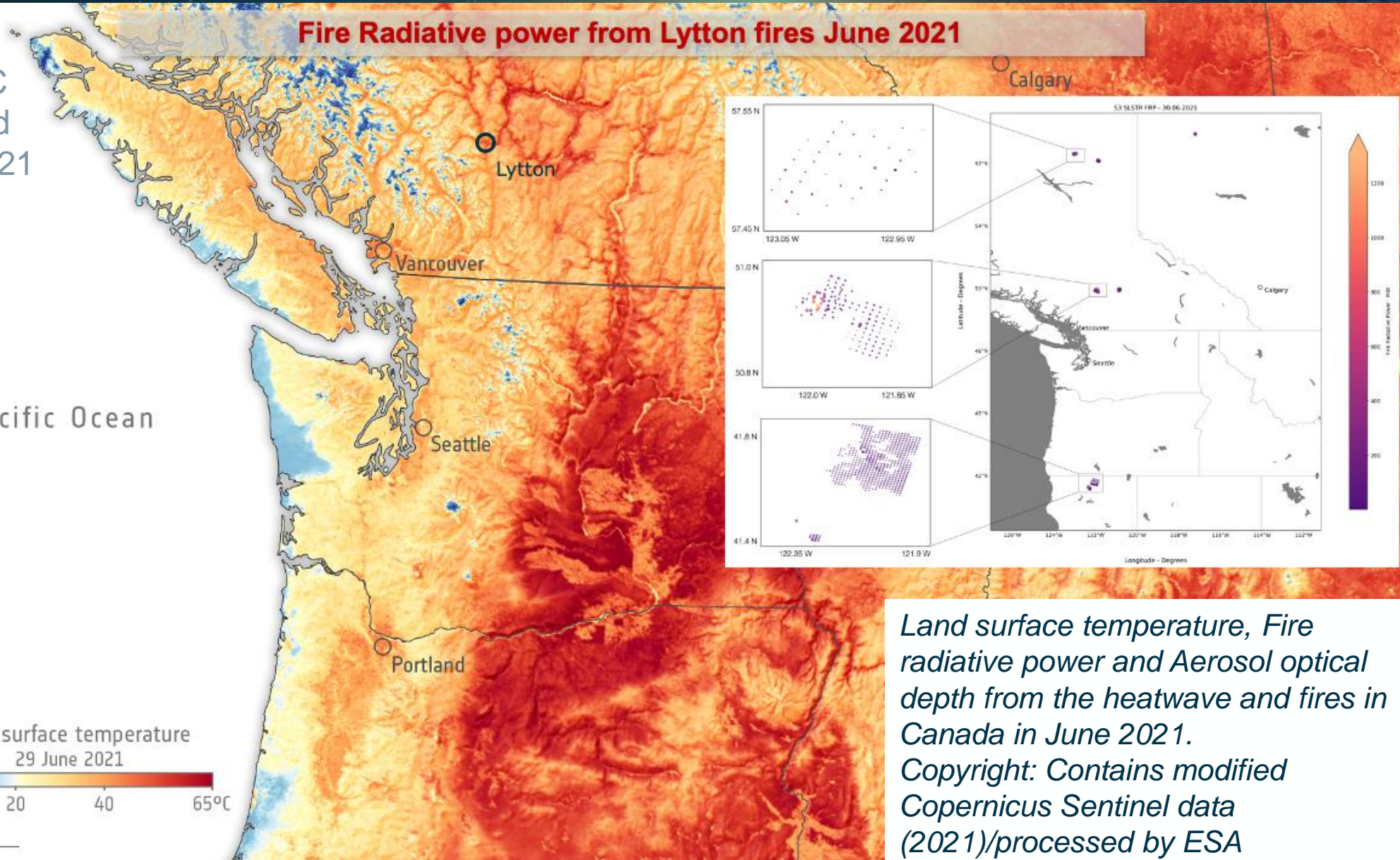
S3B_SY_AOD 01 July 2021

Aerosol Optical Depth (550 nm)

Land surface temperature
29 June 2021

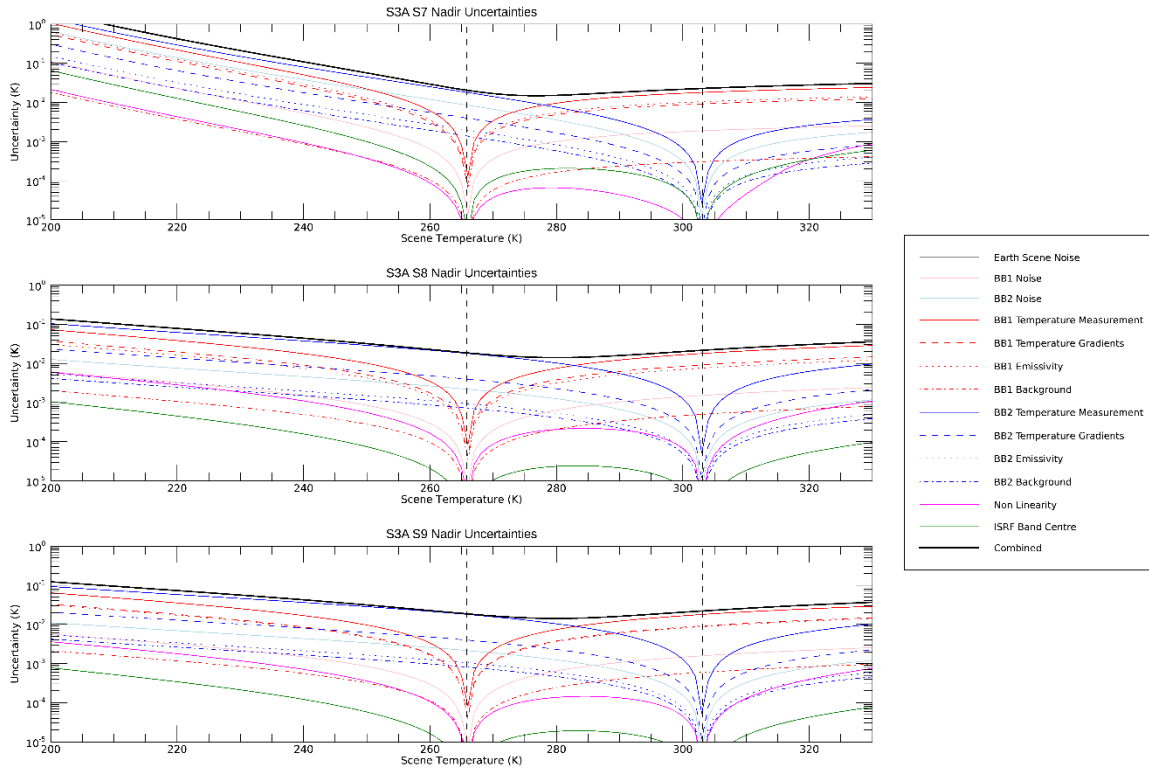


100 km



Land surface temperature, Fire radiative power and Aerosol optical depth from the heatwave and fires in Canada in June 2021. Copyright: Contains modified Copernicus Sentinel data (2021)/processed by ESA

MapnoiS3 – Level 1 uncertainties



Current versions of ADFs are based on pre-launch calibrations

MapnoiS3 python tool available for users to derive Level-1 pixel uncertainties themselves from NeDTs in L1b + further pre-launch measurement data and uncertainty model within tool (no increase in product size)

<https://www.eumetsat.int/S3-TIR-uncertainties> &

<https://www.eumetsat.int/s3-slstr-calibration-methodologies-protocols>

‘Improved’ estimates derived based on in-orbit performance (noise, stability, vicarious calibration)

See presentation by Dave Smith on SLSTR radiometric uncertainty analysis

Feedback requested from S3VT and users



Mission Integrated Calibration Monitoring & Inter-Calibration System

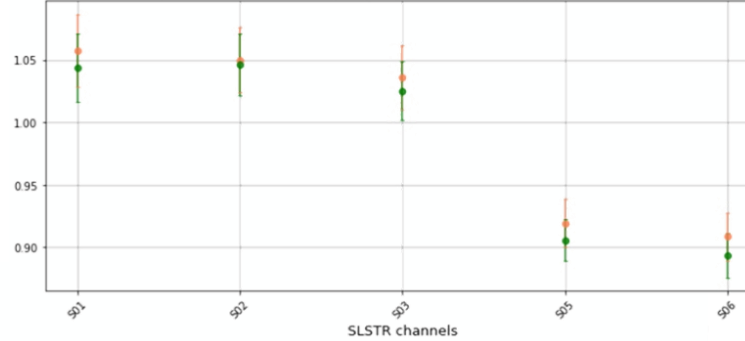
MICMICS is a multi-mission tool

- allows monitoring & analysis of radiometric calibration of GEO and LEO imagers' L1 data
- Based on multiple vicarious and inter-calibration algorithms

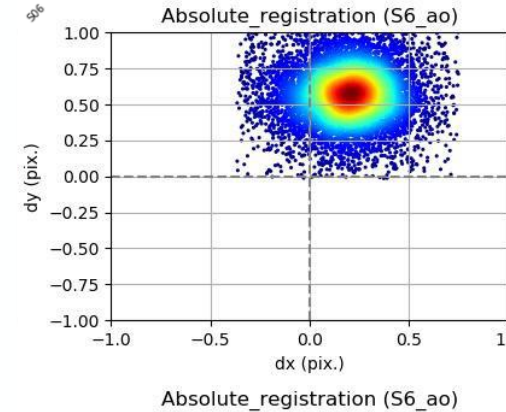
For SLSTR:

- Desert Calibration (example above)
- Deep Convective Cloud (inter-) Calibration
- Lunar Calibration (in development)
- Imager-Hyperspectral Inter-Calibration (IR)

libya4 - SLSTR-S3A(24) & SLSTR-S3B(47) subsets



PIQMICS allows the monitoring and analysis of L1 product quality from GEO and LEO imagers.



Across Track (DX)
mean=0.19
med=0.20
std=0.19

Along Track (DY)
mean=0.57
med=0.57
std=0.20

For SLSTR: OSMON:
Navigation and Registration Assessment
- Example S-3B S6oblique

See presentation by Tim Hewison on Calibration monitoring of SLSTR infrared channels with IASI inter-comparisons

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Reference SLSTR SST/IST for marine domain



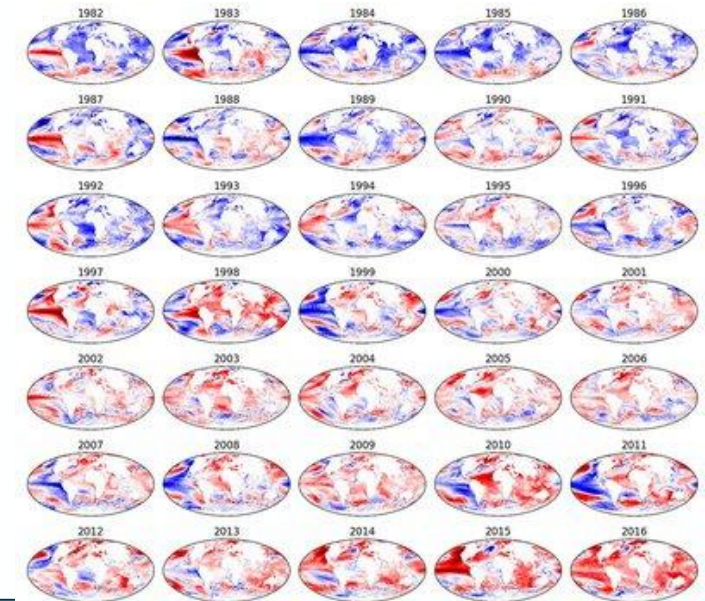
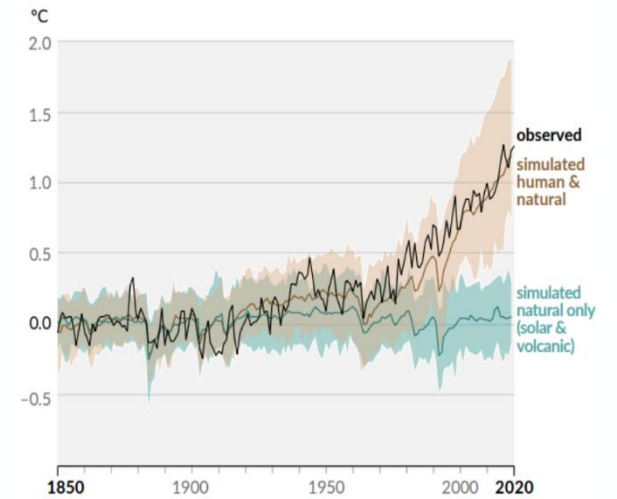
Processing baseline is now **SL__SST.003.06.01** for both SLSTR-A and SLSTR-B

Latest consistent data record is Collection 3

See Product Notice S3.PN-SLSTR-L2M.005

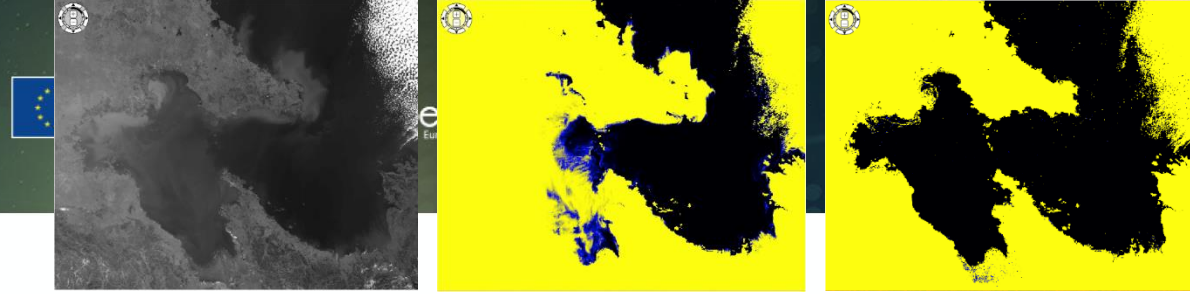
All info available on EUMETSAT webpages: <https://slstr.eumetsat.int>

(b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850–2020)



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SLSTR SST/IST – next steps

Revised SST coefficients will be deployed in Autumn 2022

Day-2 SST/day-1 IST evolutions (2025)

Bayesian coastal cloud screening

SSTdepth (in addition to SSTskin)

Sea-ice Surface Temperature (dual + nadir)

Key developments in progress (2022-2024):

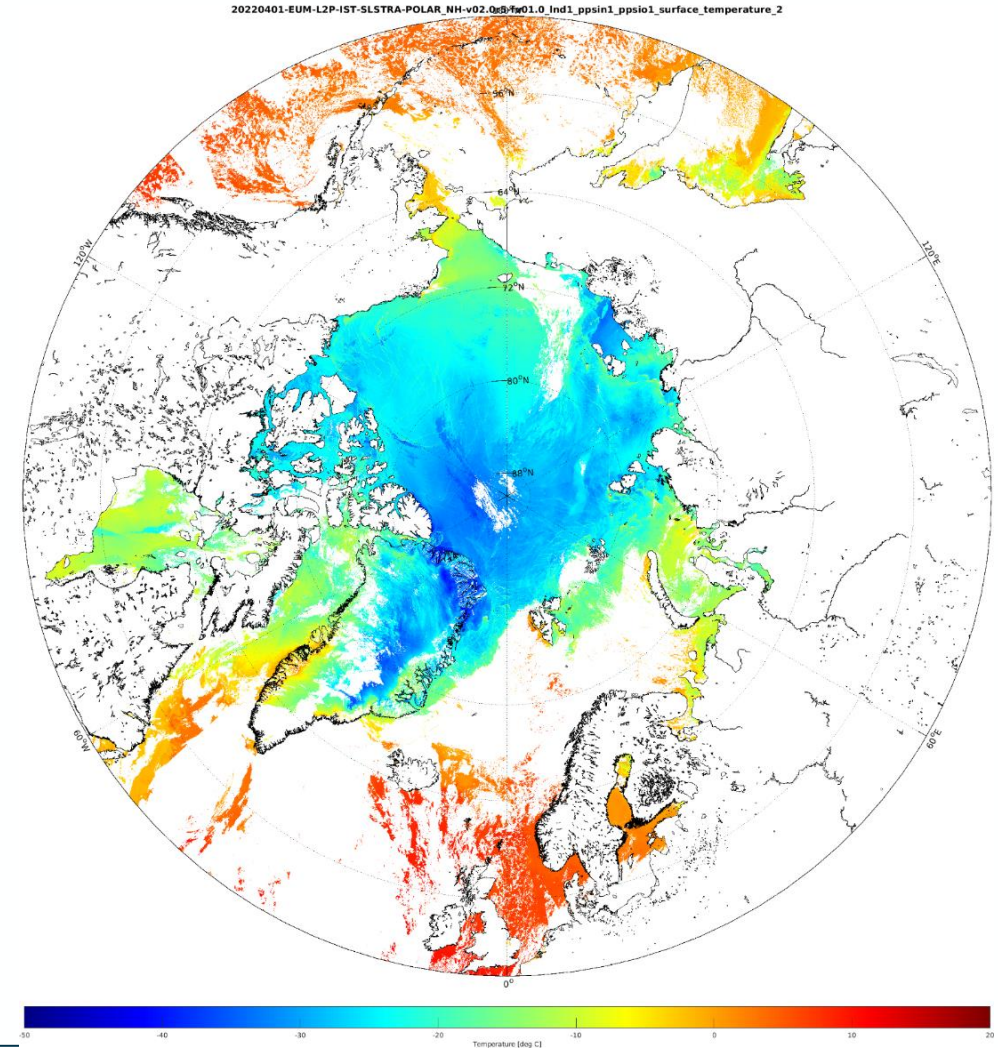
Diurnal variability model

Improved IST cloud screening (using EUMETSAT NWC SAF PPS software)

<https://www.eumetsat.int/Sci4MaST>

<https://metis.eumetsat.int>

See presentations by Gary Corlett and Igor Tomazic for the latest details on the status on Sentinel-3 SLSTR SST/IST products



Fiducial Reference Measurements for SST/IST

Copernicus drifting buoys (TRUSTED)

150+75 more buoys up to 2024

CMEMS request for High-latitudes/Baltic/North Sea/Med/Black Sea

Progress with FRM

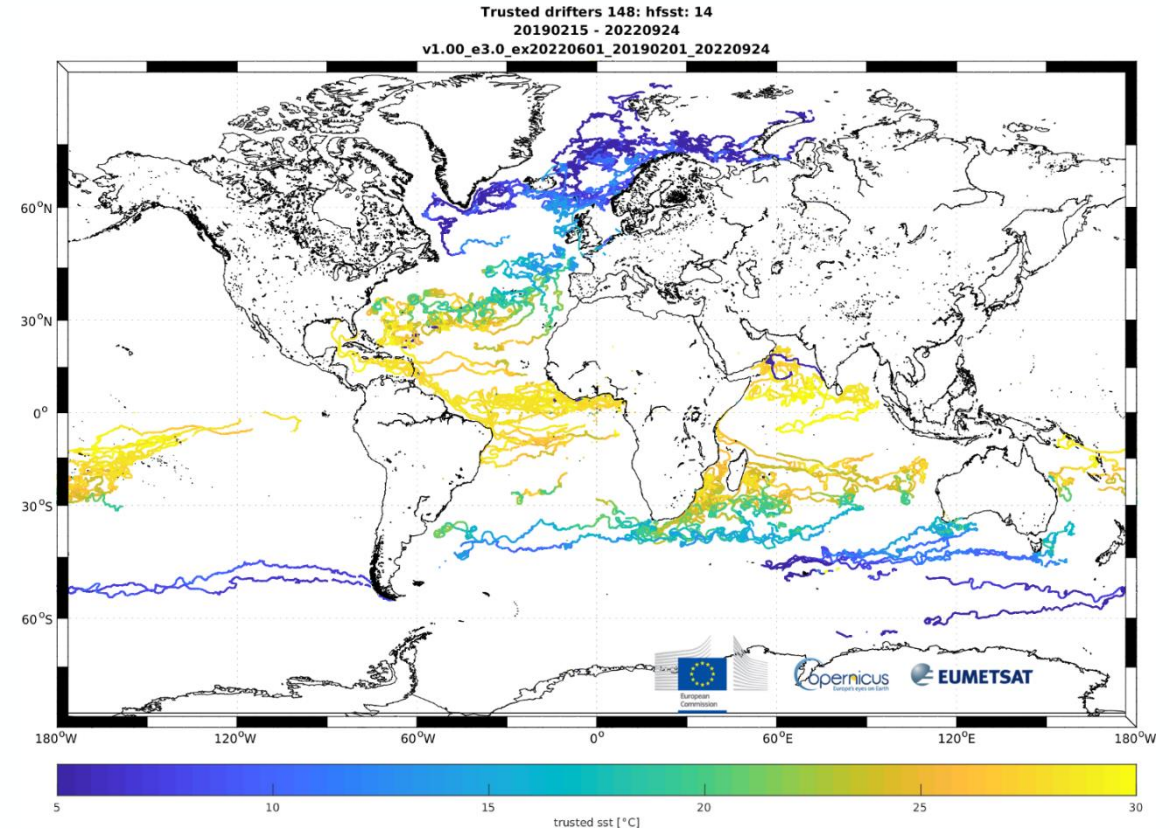
Metadata and QC

Traceability diagram and review by NMIs

Post-deployment calibration

Design, prototype and implementation of new sea-ice drifter

<https://www.eumetsat.int/TRUSTED>



See presentations by Marc Lucas and Gorm Gybkjaer for the latest details on TRUSTED Fiducial Reference Measurements

Matchup dataset available on request

SLSTR - Summary

Excellent quality operational products continue
Specific evolutions and improvements are under development

Relevant sessions:

- Common optical
- SLSTR L1 & specificities for L2 applications
- SST and Sea-ice Surface Temperature
- Land cover and temperature

Thank you all for your valuable contributions!

