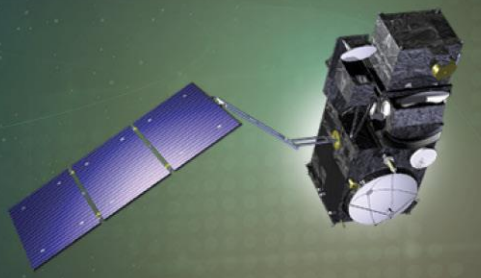
PROGRAMME OF THE EUROPEAN UNION

co-funded with

# SLSTR SST/IST Summary and recommendations



## 7th Sentinel-3 Validation Team Meeting 2022

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


Anne O'Carroll and S3VT SST/IST team
EUMETSAT

# Status of key recommendations from S3VT-6 (1)

**S3VT-T endorse current EUMETSAT plans for Day-2 SST and Day-1 sea-IST**

- CMEMS confirmed request for inclusion of SSTdepth (in addition to SSTskin) in Day-2 product.
- Day-2 evolution should include addition of Quality Levels to the WCT products.
- To provide separate dual and nadir SST fields in day-2 WST.

**-> In progress for day-2 developments. See talk by Gary Corlett.**

**-> Further feedback requested at S3VT7.**

**Evolution of harmonisation methodology across EUMETSAT SST products with SLSTR as a reference**

- Including coordination with OSI SAF.

**-> In progress with all products planned to have both skin and depth SST provided. These are part of longer term plans and in particular need developments on diurnal variability models.**

# Status of recommendations from S3VT-6 (2)

## SLSTR Sea-Ice Surface Temperature (IST)

- Further sea-ice cloud screening development is needed and inter-comparison of currently available sea-ice cloud screening schemes

**-> In progress, see talk by Igor Tomazic at S3VT7**

- Consideration and clarification needed together with GHRSST on how to integrate sea-IST with SLSTR SST processor and L2M product format

**-> discussions in progress and feedback still requested from S3VT**

- Important validation work at high-latitudes should be continued and extended to MIZ using Saildrone and included in MDB.

**-> Many presentations of validation at high-latitudes and including Saildrone at S3VT7**

## Evolution of Fiducial Reference Measurements

- Development of means and facilities for Fiducial sea-Ice Surface Temperature observations
- Further validation of inland waters and lakes should be done and further in situ measurements obtained

**-> great progress with many presentations at S3VT7. This is a need to continue FRM observations for Sentinel-3**

# Sea-Surface Temperature / Ice Surface Temperature - Agenda

Gary Corlett – Status of Copernicus Sea-Surface Temperature

Jean-Francois Piolle / Igor Tomazic - Felyx new release of the distributed and cloud-ready multi-matchup dataset

Luisa Lamas - Sentinel-3 SLSTR validation using in-situ data collected by the MONIZEE system Portugal

Andy Harris - Evaluation of Sentinel-3 SLSTR data for bias correction of NOAA's high-resolution global SST

Igor Tomazic - Copernicus demonstrational SLSTR sea ice surface temperature

Gorm Dybkjaer - Development of a reference instrument for sea ice surface temperature

Marc Lucas - Fiducial Reference Measurement drifting buoy data for Sentinel-3 SLSTR validation

Frank Goettsche - Thermal infrared product inter-comparison and validation with FRM radiometers

Elodie Da Silva - Scientific Service Framework for Copernicus SST/IST Product Improvement and Cal/Val Tools

Peter Minnett - Comparison of SLSTR Clear-Sky infrared measurements with those of geostationary imagers, and skin SST accuracy assessment using ship radiometers

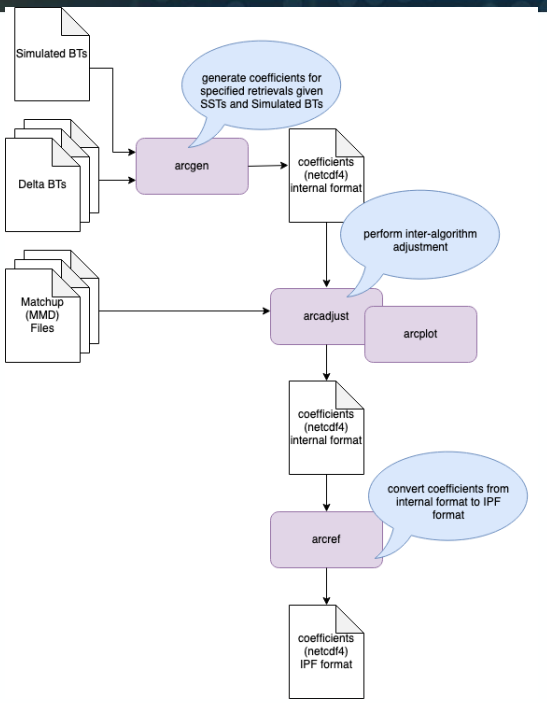
Werenfrid Wimmer - Sentinel-3 SLSTR SST validation using a Fiducial Reference Measurements (FRM) service

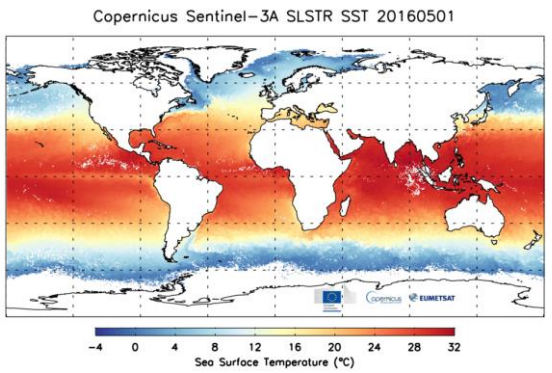
Chong Jia - The feasbility of using radiometers on Saildrones for the validation of satellite-derived skin SST

# Sea-Surface Temperature

Gary Corlett:

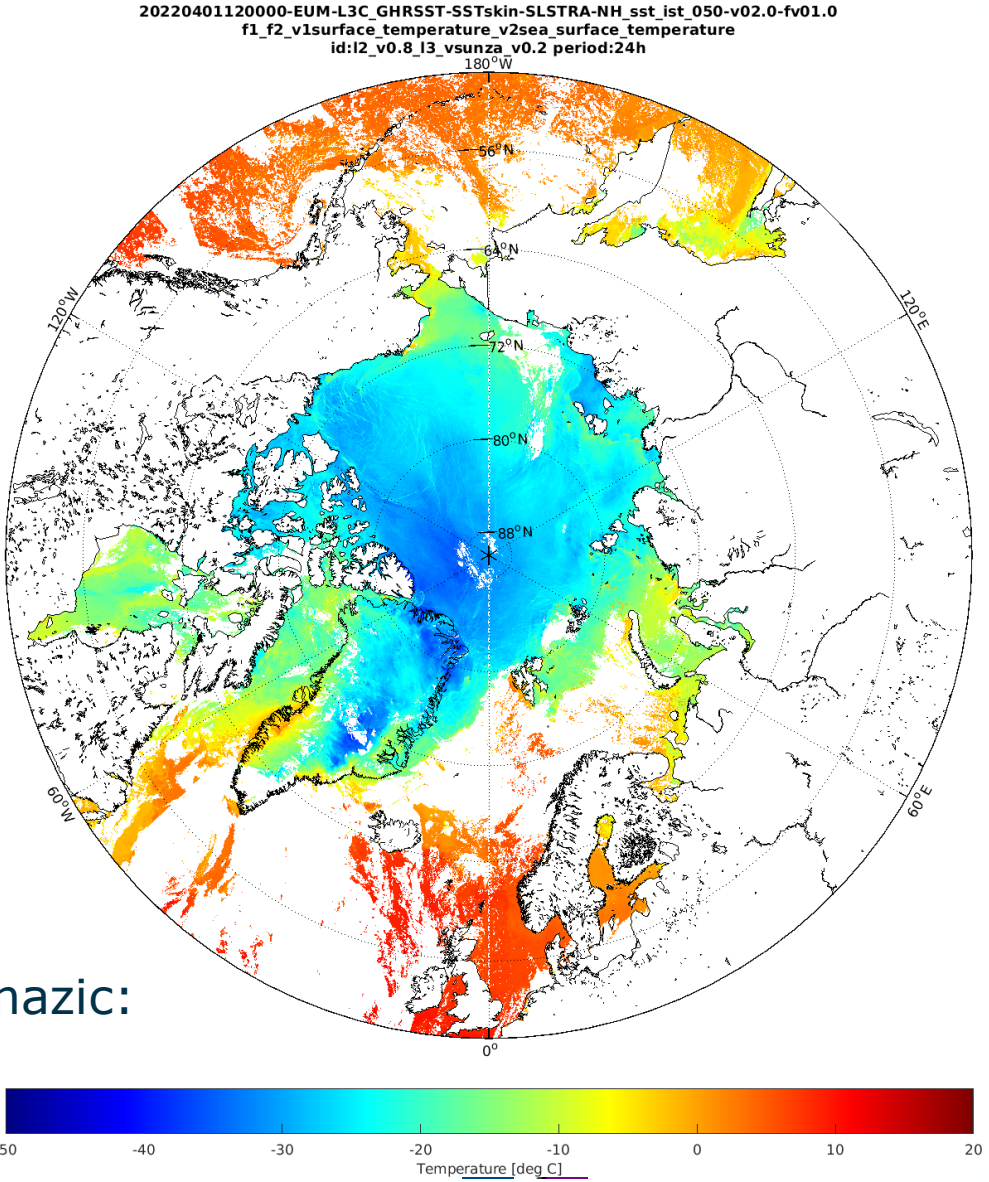
- Key autumn 2022 updates: new SST coefficients, revised SSES values, revised uncertainty model and quality level scheme.
  - New validation results of updates show well within 0.1K accuracy for all algorithms.
- Further evolutions in progress: Bayesian cloud in coastal areas to reduce number of false flagging especially optically challenging regions focusing on daytime; depth SST.
- Discussion on product formats for day-2 evolutions:
  - Feedback sought on format specification for day-2 evolutions
  - CMEMS will provide feedback, although use both full nadir and dual view swath
- Discussion on Quality Level tests (as current ADI QL4 removing a lot of cloud):
  - Revised scheme will: remove ADI test for single-view and move ADI test to QL=2 for dual-view; QL=4 will now be twilight; QL=3 will now be high satellite zenith angle (nadir-only)
  - Changes to Aerosol Dynamic Indicator should be validated before day-2



# Sea-ice Surface Temperature and high-latitude

- Demonstration SLSTR IST available on WEkEO (email s3.sst@eumetsat.int for access)
- IST L3 demo implemented and available soon to users in WEkEO
- Update to sea-ice cloud screening just implemented (using EUMETSAT NWC SAF PPS software) with very promising initial results
- Further progress underway on: sea-ice cloud-mask, flags and QL tuning; and cloud-mask and IST validation
- Feedback welcome on IST demo products
- Operational products planned for 2025
- Sea-ice drifter requirements and specification almost complete -> design and prototype next year



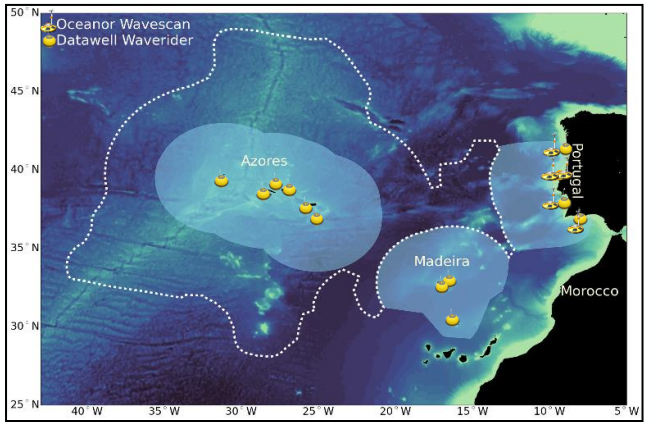

Igor Tomazic:

# SST/IST validation and tools

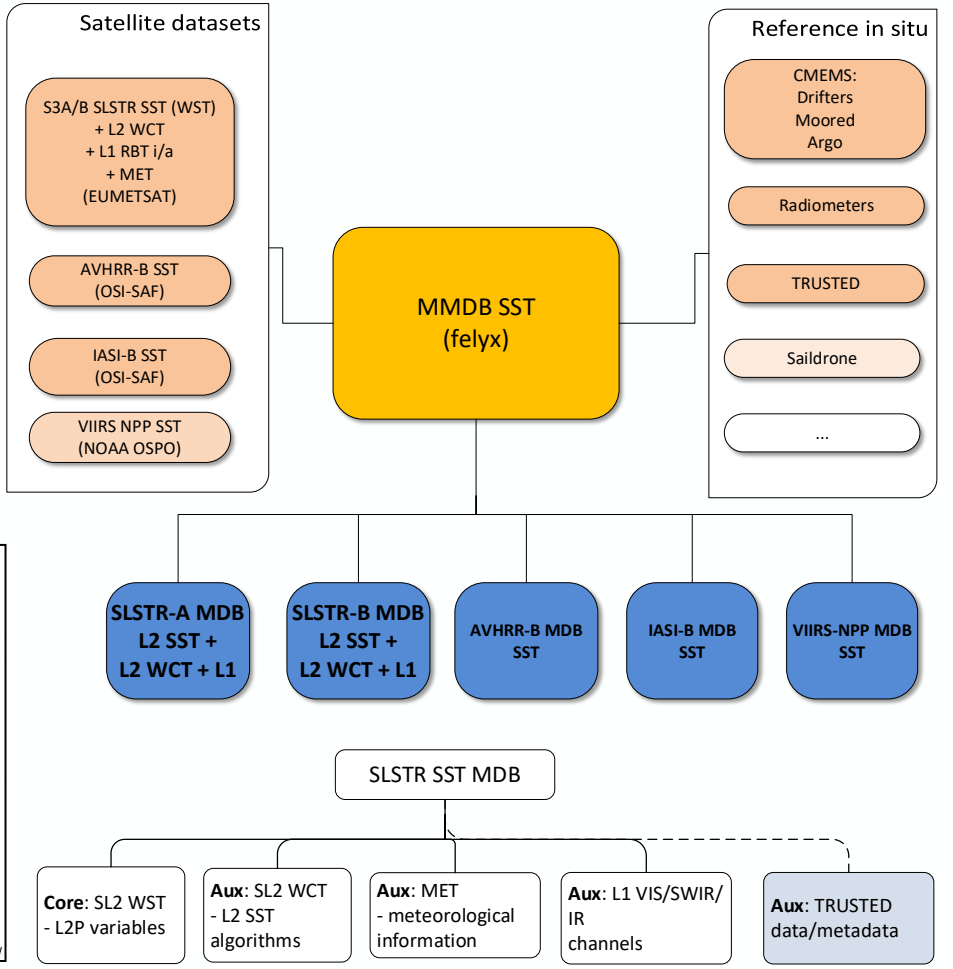
- SLSTR matchup dataset continuation and evolutions coordinated with S3VT team
- Preparation of notebooks considered for reading and visualizing new MMDB outputs (Coordination with GHRSST MDB Task Team)

- Further in-situ validation needs:
  - Lakes and inland waters
  - Coastal regions
  - High-latitudes e.g. Saildrone
  - Sea-ice drifting buoys

## Luisa Lamas (IH):



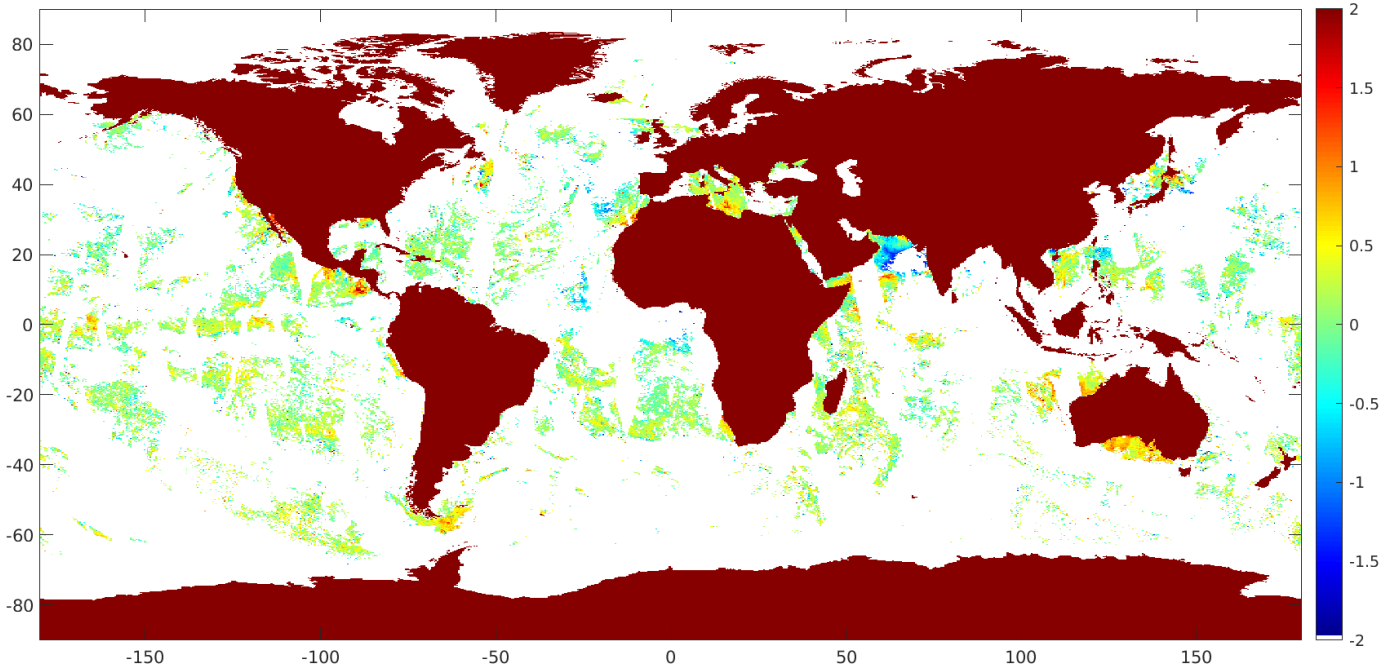

## Igor Tomazic / Jean-Francois Piolle:



# SLSTR reference SST

- Excellent quality of SLSTR SST means it is recommended as a reference sensor
- Particular strength with robustness to aerosol
- A more detailed look at quality levels and Aerosol Dynamic Indicator may increase the coverage available for reference applications in specific regions
- Current developments on coastal Bayesian cloud screening and the day-2 work will contribute
- There is a need for further investigations on how SST satellite data is used as a reference considering the use of other sensors, and perhaps this is an activity to be pursued in GHRSST

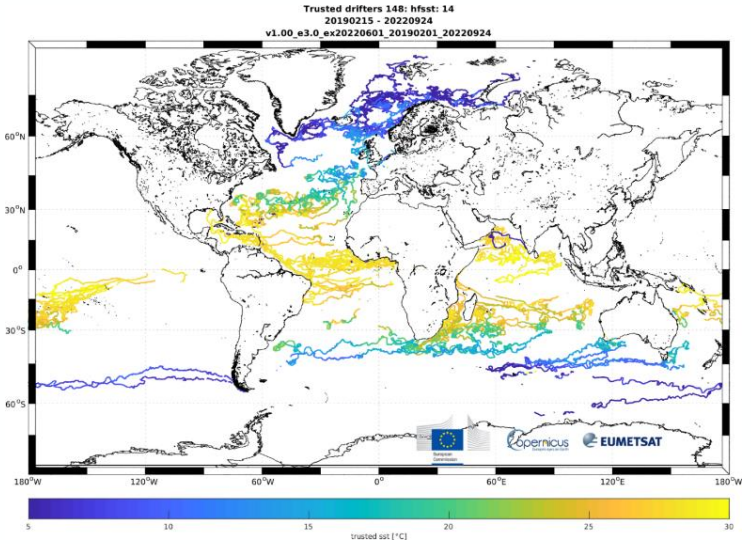
MetOp-B Daytime April 1st 2021 (Andy Harris)



# Fiducial Reference Measurements

- Excellent work on provision of FRM continue:
  - Copernicus drifting buoys (TRUSTED)
  - Radiometers and ships4sst
  - FRM inter-comparisons exercises

- Confirmed/obtained very good SLSTR SST performance using ship radiometers: throughout ships4sst radiometer network; inland water over Lake Constance
- Need for FRM operations to continue to support ongoing Sentinel-3 validation activities
- Further work should continue on traceability uncertainty diagrams, metadata and QC procedures, inter-comparisons, post-deployment calibration, coordination with NMIs



# Summary of recommendations (1)

- Day-2 SST evolutions
  - The ongoing developments and evolutions to day-2 SST are endorsed by the S3VT. Specific feedback is required on product specification details and further validation of the quality levels and aerosol dynamic indicator are recommended within the day-2 validation activities. Progress towards a dual-view Bayesian cloud-screening would be beneficial.
  - The SLSTR matchup dataset is a key tool for the S3VT-SST/IST and upcoming changes will be coordinated with the matchup users, along with notebooks for visualisation and analysis.

- Day-1 IST
  - The ongoing improvements to the demonstration SLSTR IST products is supported and the need for further sea-ice cloud tuning, validation and inter-comparisons recommended and in progress.

# Summary of recommendations (2)

- SLSTR reference SST
  - SLSTR SST is of excellent quality for reference purposes. Further investigations on how to optimally use satellite SST data as a reference together with other satellite data would be beneficial and is a topic to be pursued within GHRSST. Specific improvements to SLSTR SST to improve clear-sky screening particularly in persistently cloudy, coastal and aerosol regions would increase its use-ability as a reference and these are in progress in the day-2 developments and should be continued.

- Fiducial Reference Measurements
  - Long-term continuation of FRM operations is needed for Sentinel-3 SST/IST validation including the global spread of TRUSTED drifting buoys and ship-borne radiometers.
  - The investigation of the use and design of new in situ sources such as in coastal areas, inland waters and high-latitudes e.g. Saildrone and sea-ice drifting buoys.

# Summary and conclusions

Excellent quality validation activities and presentations were described by the S3VT-SST/IST team.

The quality of the current SST operational products were endorsed and support to the ongoing SST/IST developments expressed.

Several further specific investigations, validation and analysis were identified that would benefit future product evolutions.

Thank you all for your valuable contributions!