EUMETSAT NOAA MONITORING & EVALUATION OF THEMATIC INFORMATION FROM SPACE METIS

MONITORING AND EVALUATION OF SST PRODUCTS IN THE EUMETSAT METIS FRAMEWORK: A YEAR OF S3A SLSTR DATA AND PREPARATION FOR S3B

http://metis.eumetsat.int

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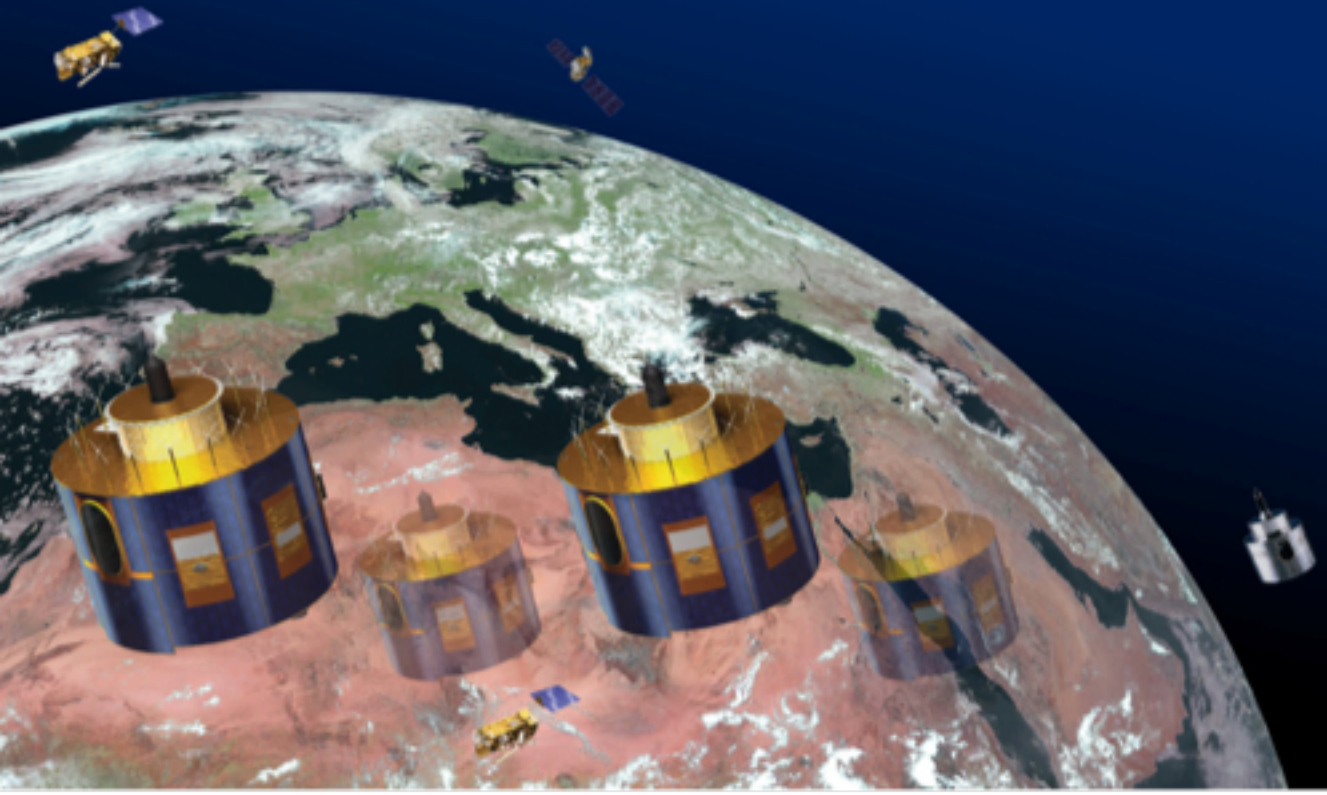
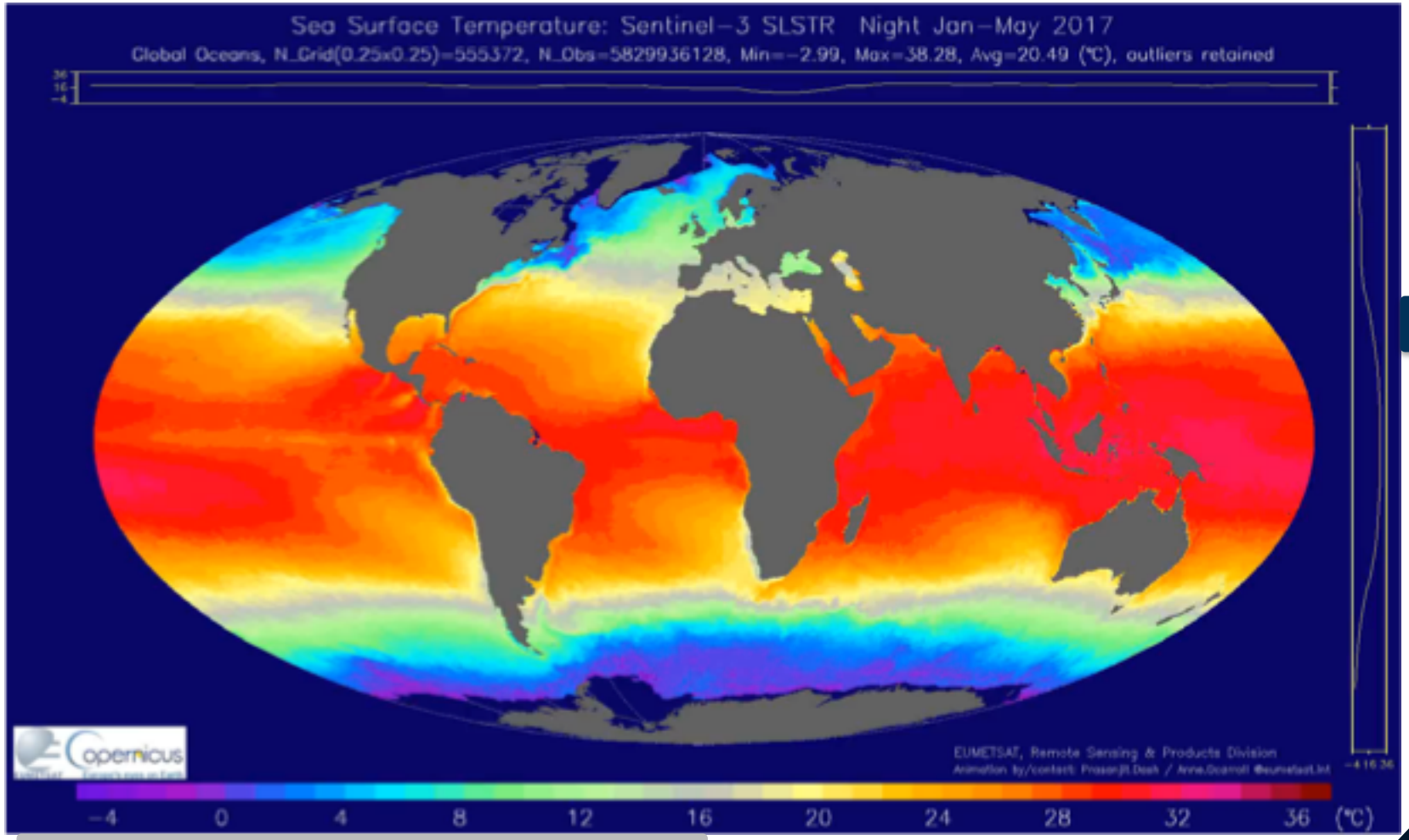


Thanks:
Bojan Bojkov, Eumetsat RSP Head
Francois Montagner, Eumetsat RSP MA Lead
Paul DiGiacomo, NOAA STAR SOCD Chief

NOAA STAR SST team for SQUAM

S3A SLSTR SST: *The Problem Statement*

METIS



L1B

SCIENTIFIC CHALLENGES

- **Inverse algorithm**
- **Cloud detection**
- **Monitoring evaluation**

(roles are interwoven) [Monitoring System can evaluate above two]

adapted from:
P. Dash, A. O'Carroll, C. Donlon, G. Corlett
7-Nov-2017, ISRO SAC, India

Focus of this talk: routine monitoring of EUM SST products. Set-up inspired by NOAA SQUAM.
Dash, Ignatov, Kihai, Sapper, 2010. JTECH. The SST Quality Monitor

Highlights

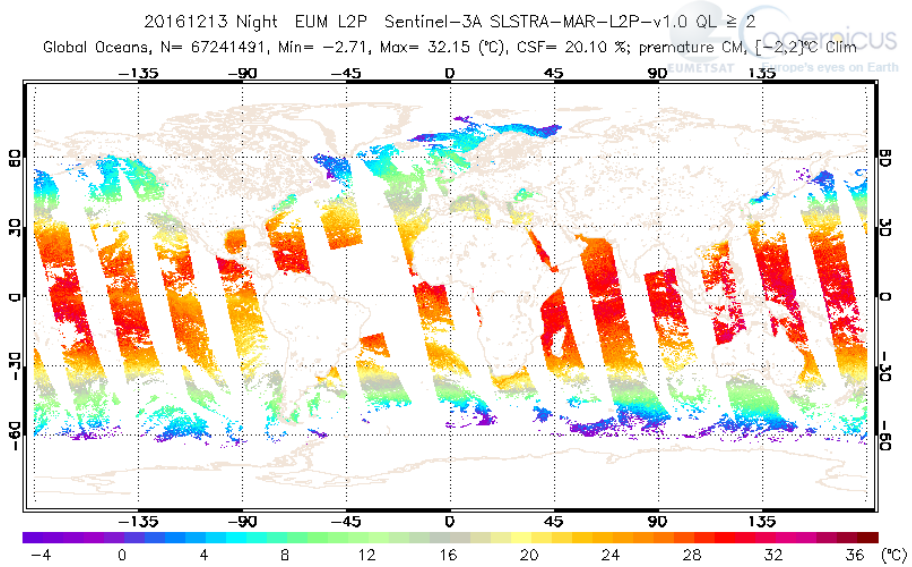
1. Concept

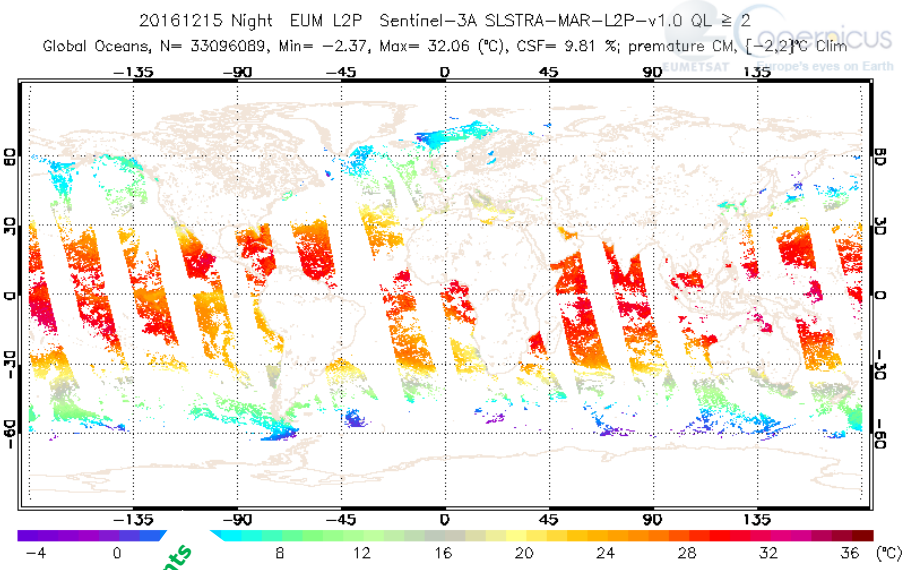
2. METIS
    1. Online interface and diagnostic metrics. (Public and internal versions)
    2. A few case studies
    3. Spin-offs, extreme events

3. Further plans with Sentinel-3 A/B/C
    1. Extend METIS-SST
    2. EUM RSP / NOAA SOCD collaboration
    3. OceanWatch Monitor (OM) – sneak preview

Concept

State space





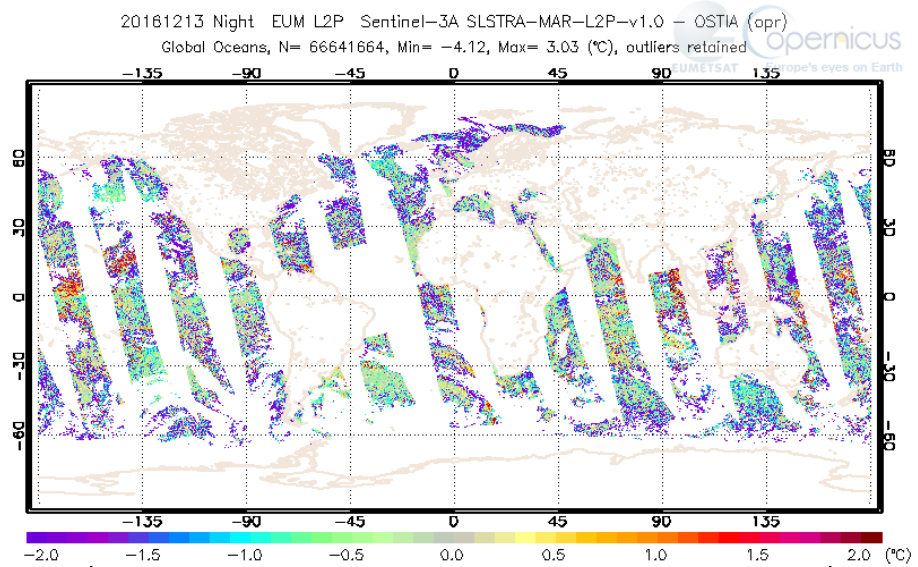
older AATSR SRF

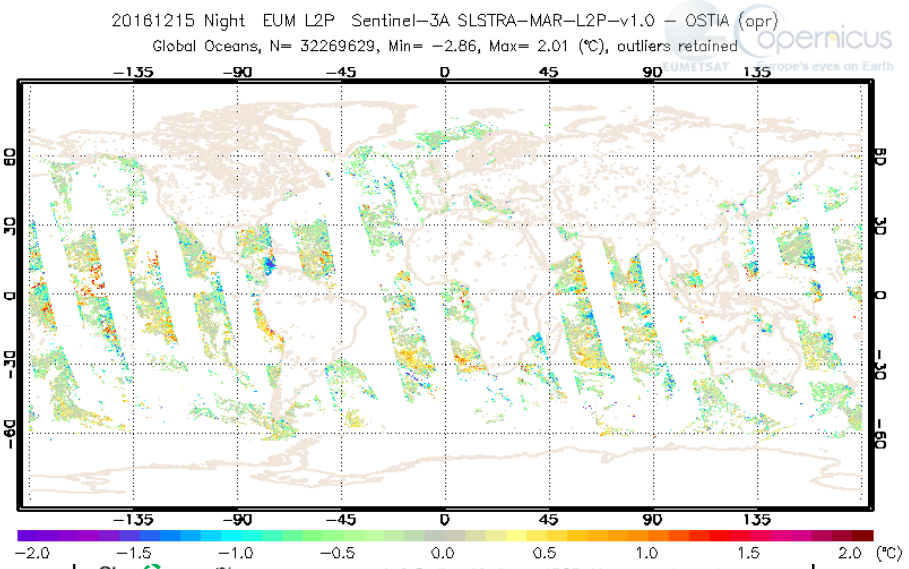
Initial version of SLSTR-specific coefficients and cloud mask implementation

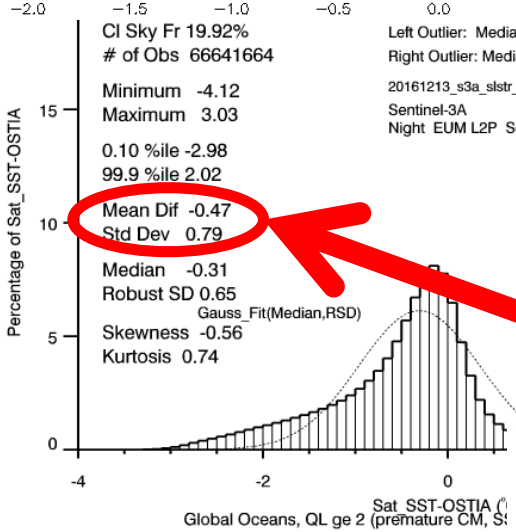
adapted from:
P. Dash, A. O'Carroll, I. Tomazic, G. Corlett
FRM Meeting, 20-21-June-2017, PML, Plymouth, UK

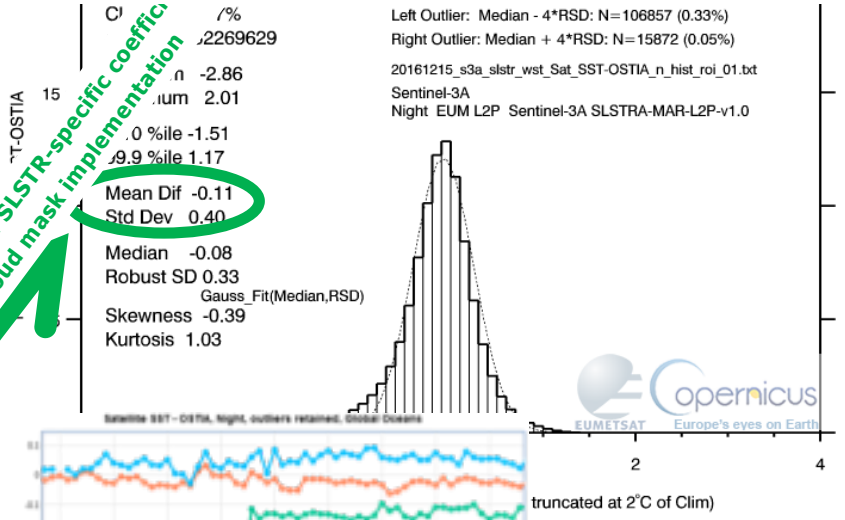
Concept (cont.)

Residual space









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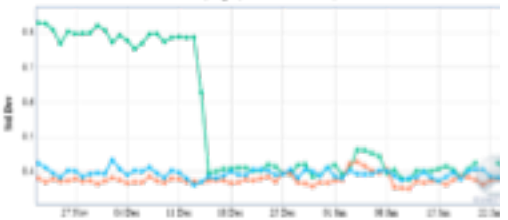
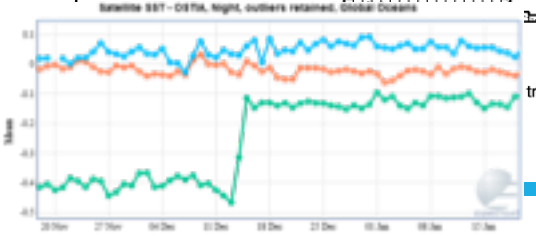
Initial version of SLSTR-specific coeffic and cloud mask implementation





METIS
online interface and various modules: *http://metis.eumetsat.int*

METIS

EUMETSAT MONITORING WEATHER AND CLIMATE FROM SPACE

METIS | METIS-SST | METIS-OC | EUMETSAT WEBSITE

METIS

Monitoring & Evaluation of Thematic Information from Space (METIS)

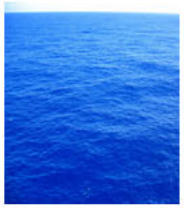
The Monitoring and Evaluation of Thematic Information from Space (METIS) tool is developed to monitor EUMETSAT operational remotely sensed products for stability, quality and performance on a global and regional basis in routine. The current METIS modules are:

METIS-SST

METIS-SST, the Sea Surface Temperature component of Monitoring & Evaluation of Thematic Information from Space (METIS), provides near-real time diagnostics of EUMETSAT operational level-2 (L2) satellite SSTs.

Current Satellite SST Products monitored in METIS-SST are from: Sentinel-3A SLSTR, Metop-B (M1) AVHRR and M1 IASI.

GLOBAL + Regional (15 pre-defined); against Daily fields and Climate;
1 Public; several internal versions



METIS-OC

METIS-OC, the OC component of Monitoring & Evaluation of Thematic Information from Space (METIS), provides near-real time diagnostics of EUMETSAT operational level-2 and level-3 satellite Ocean Colour products.

Current Satellite OC Products monitored in METIS-OC are from: Sentinel-3A OLCI, Aqua (AQ) MODIS, OrbView-2 SeaWifs, Envisat MERIS and Suomi-NPP VIIRS.

CONTACT: IGOR for any 'bad news'; Gary for any 'potential bug' in the system

The SST component of METIS is inspired by SQUAM, the NOAA SST Quality Monitor, developed by Prasanjit Dash and Alexander Ignatov (NOAA), and is expanded to other thematic information.

CONTACT US
LEGAL INFORMATION

FOLLOW US ON

MEMBER STATES

COOPERATING STATES

METIS-SST : Global + 15 Regional ROIs

online interface and various modules : *http://metis.eumetsat.int/sst/index.html*

METIS

EUMETSAT MONITORING WEATHER AND CLIMATE FROM SPACE

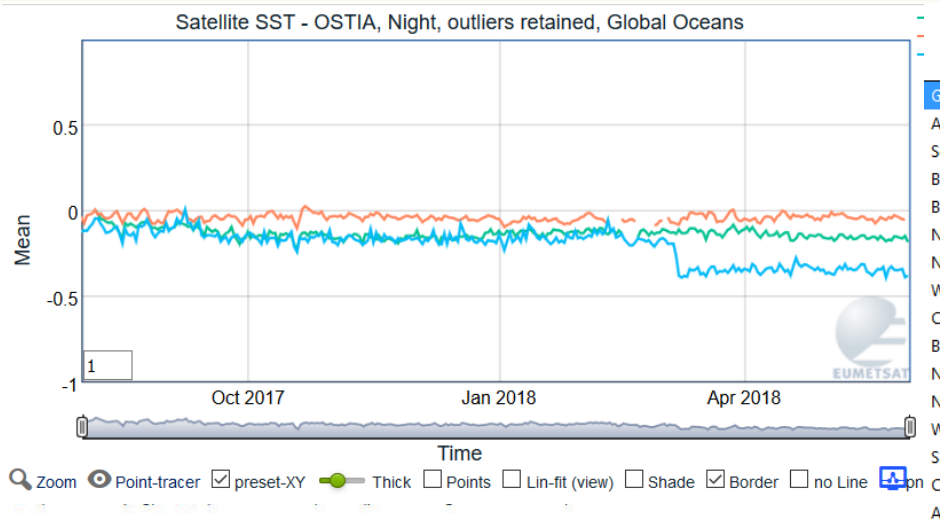
METIS | METIS-SST | METIS-OC | EUMETSAT WEBSITE

STATISTICAL TIME SERIES: GLOBAL OCEANS

- METIS-SST
- Data Sources 3
- Plots 5
- Maps
- Histograms
- Time-series Statistics
- Double Differencing
- Geophy Dependence
- References
- Quickstart Guide

Statistical Parameters

CSF % | Num
Min | 0.01 percentile
Max | 99.99 percentile
Mean | Median
StdDev | RSD
Skew | Kurt
Low out | High out



Global
Arctic
Southern
Black Caspian
Baltic
Northwest Atlantic
Northeast Atlantic
W+E Mediterranean
Caribbean+Cabo Verde
Brazil+Guinea+S.Atlan
NE+N.Cen + NW Pacific
N.+S. Equatorial Pacific
Warm pool Pacific
S.Cen+SE+Australia Pac
Central Indian Ocean
Arabian + Red Sea

Area of Interest: Global

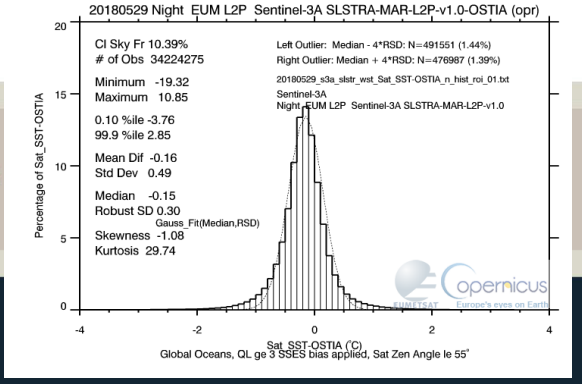
Reference SST: OSTIA 5km Daily

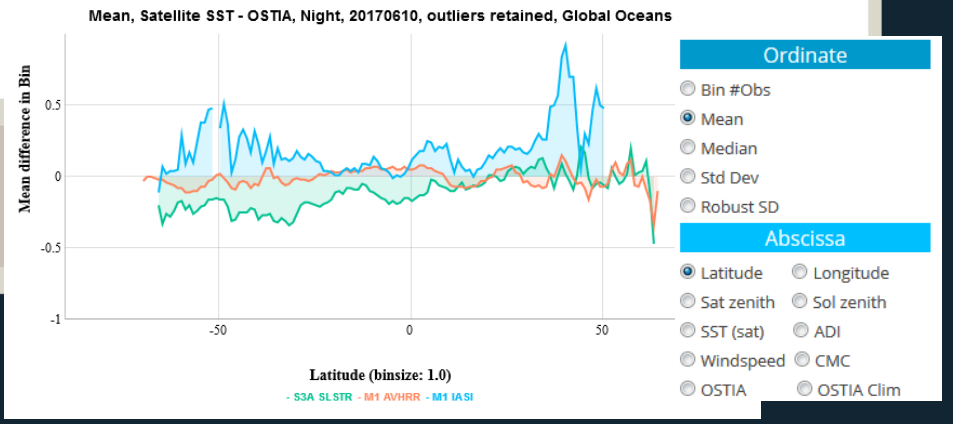
Aggregation Time: Daily | Monthly

Outlier handling: Retained | Removed

Scene: Night | Day

Product of Interest
- Sentinel-3A SLSTR
- Metop-B AVHRR
- Metop-B IASI
- Select all



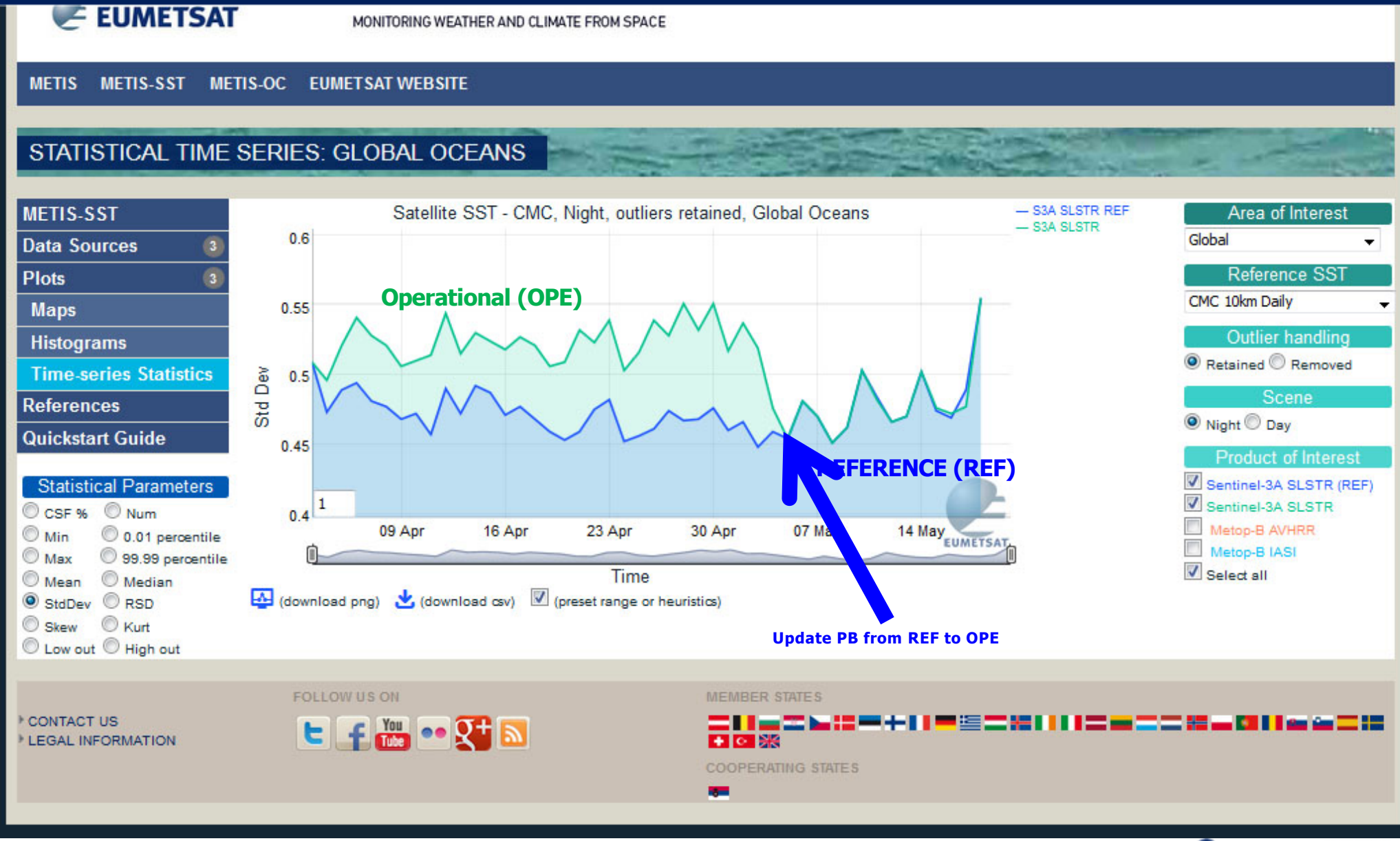


Ordinate
- Bin #Obs
- Mean
- Median
- Std Dev
- Robust SD

Abscissa
- Latitude | Longitude
- Sat zenith | Sol zenith
- SST (sat) | ADI
- Windspeed | CMC
- OSTIA | OSTIA Clim

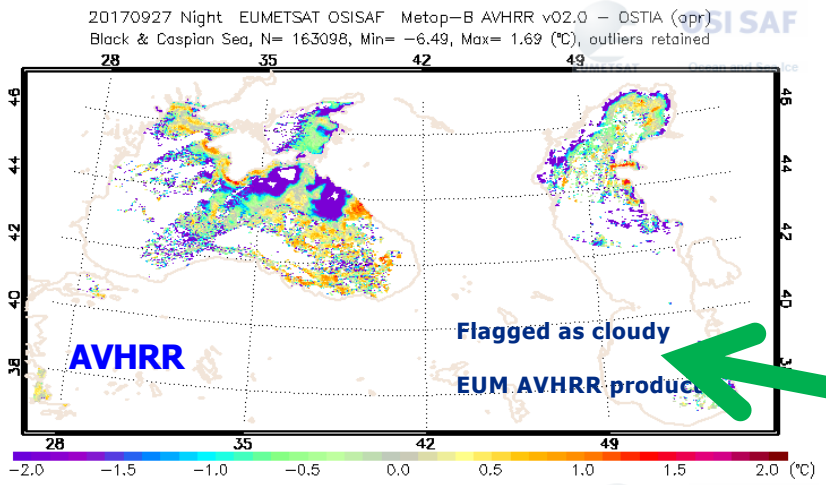
CONTACT US
LEGAL INFORMATION

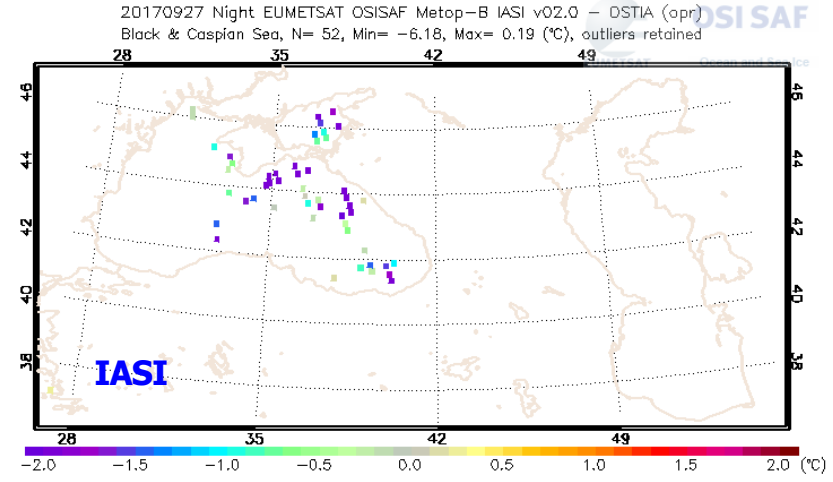
Some more case studies: **Sentinel-3A WST REF/OPE transition**

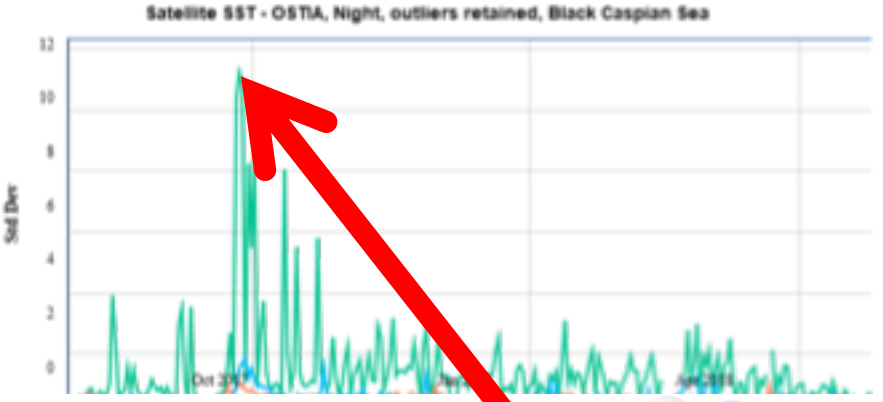


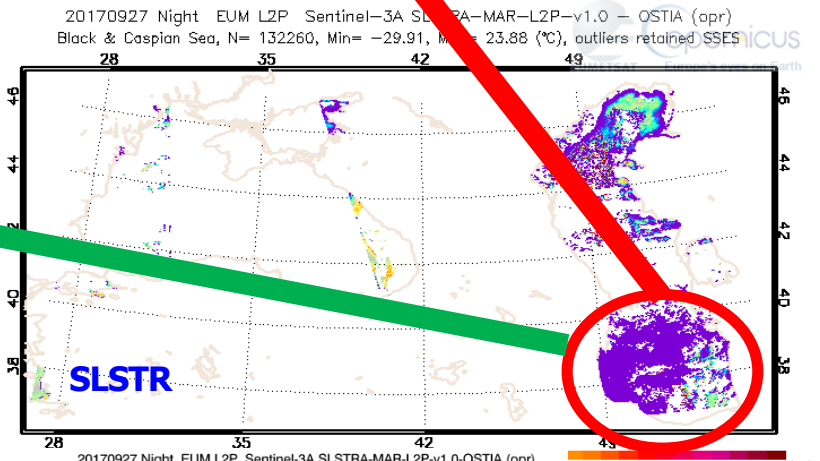
METIS – example diagnostics
Highlight issues: an example of cloud leakage

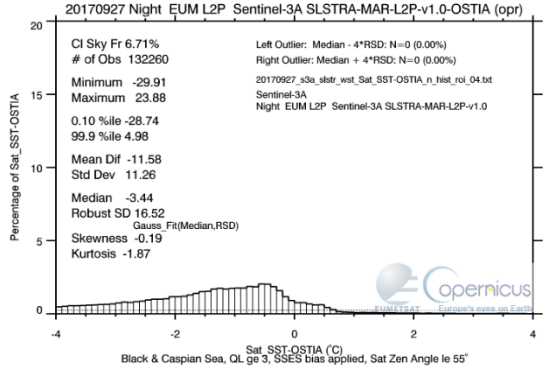
http://metis.eumetsat.int/sst/index.html
(Std Dev peaks because of cloud leakage)











Monitoring/Validation: Summary (all pixels; incl. extreme values)

Comparison against OSTIA

Blue: Night **Red: Day**

Products	~ECT	#	Min / Max (◦C)	Min / Max (◦C) Robust	Mean* / Median	Std Dev/ Rob Std Dev	Skew / Kurt
S3A SLSTR	10:00 /22:00	32 mil 29 mil	-26 / 15 -22 / 24	-4.3 / 2.0 -4.0 / 2.6	-0.13 / -0.09 0.00 / -0.01	0.53 / 0.31 0.59 / 0.39	-3.1 / 61 -1.5 / 43
Metop-B AVHRR	09:30/ 21:30	64 mil 53 mil	-10 / 8.1 -9.5 / 12	-2.5 / 1.6 -2.5 / 1.9	0.04 / 0.01 -0.04 / -0.02	0.42 / 0.32 0.43 / 0.32	-1.0 / 9.4 -0.43 / 10
Metop-B IASI		71 K 75 K	-6.8 / 5.7 -5.9 / 6.3	-3.0 / 2.8 -2.7 / 3.2	-0.21 / -0.15 -0.13 / -0.09	0.57 / 0.47 0.54 / 0.43	-0.23 / 8.0 0.32 / 9.9

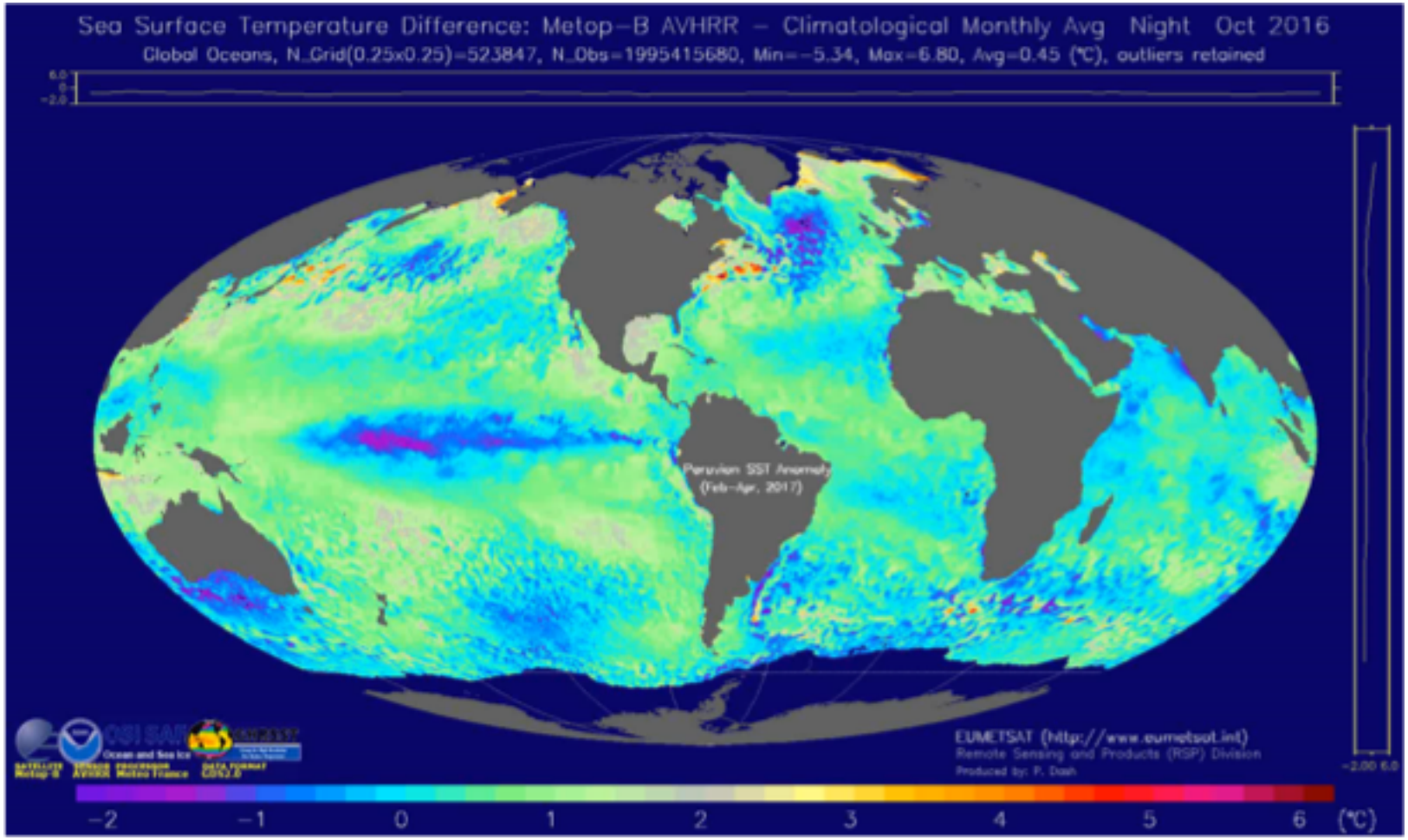
Comparison against DRIFTERS

Products	~ECT	#	Min / Max (◦C)	Min / Max (◦C) Robust	Mean* / Median	Std Dev/ Rob Std Dev	Skew / Kurt
S3A SLSTR	10:00 /22:00		-4.2 / 3.1 -3 .1 / 3.4	-2.7 / 1.4 -2.6 / 2.6	-0.22 / -0.18 -0.08 / -0.08	0.37 / 0.23 0.49 / 0.32	-1.5 / 15.3 0.38 / 6.0
Metop-B AVHRR	09:30/ 21:30		-5.1 / 5.4 -4.1 / 4.2	-2.8 / 2.4 -2.7 / 2.5	-0.12 / -0.05 -0.09 / -0.04	0.49 / 0.36 0.44 / 0.33	-0.9 / 9.0 -0.8 / 8.7
Metop-B IASI			-7.6 / 4.6 -5.3 / 4.2	-3.9 / 2.0 -3.2 / 1.9	-0.45 / -0.40 -0.35 / -0.05	0.58 / 0.45 0.49 / 0.36	-0.98 / 14.2 -0.88 / 9.0

*SSES bias applied for SLSTR

There are significant extreme values in S3A SST (outliers) – known issues?
If these extremes are excluded, performance is MOSTLY better than or equal to baseline products (here M1 AVHRR, M1 IASI)

METIS
Spin-off potential, extreme events; Peruvian SST anomaly



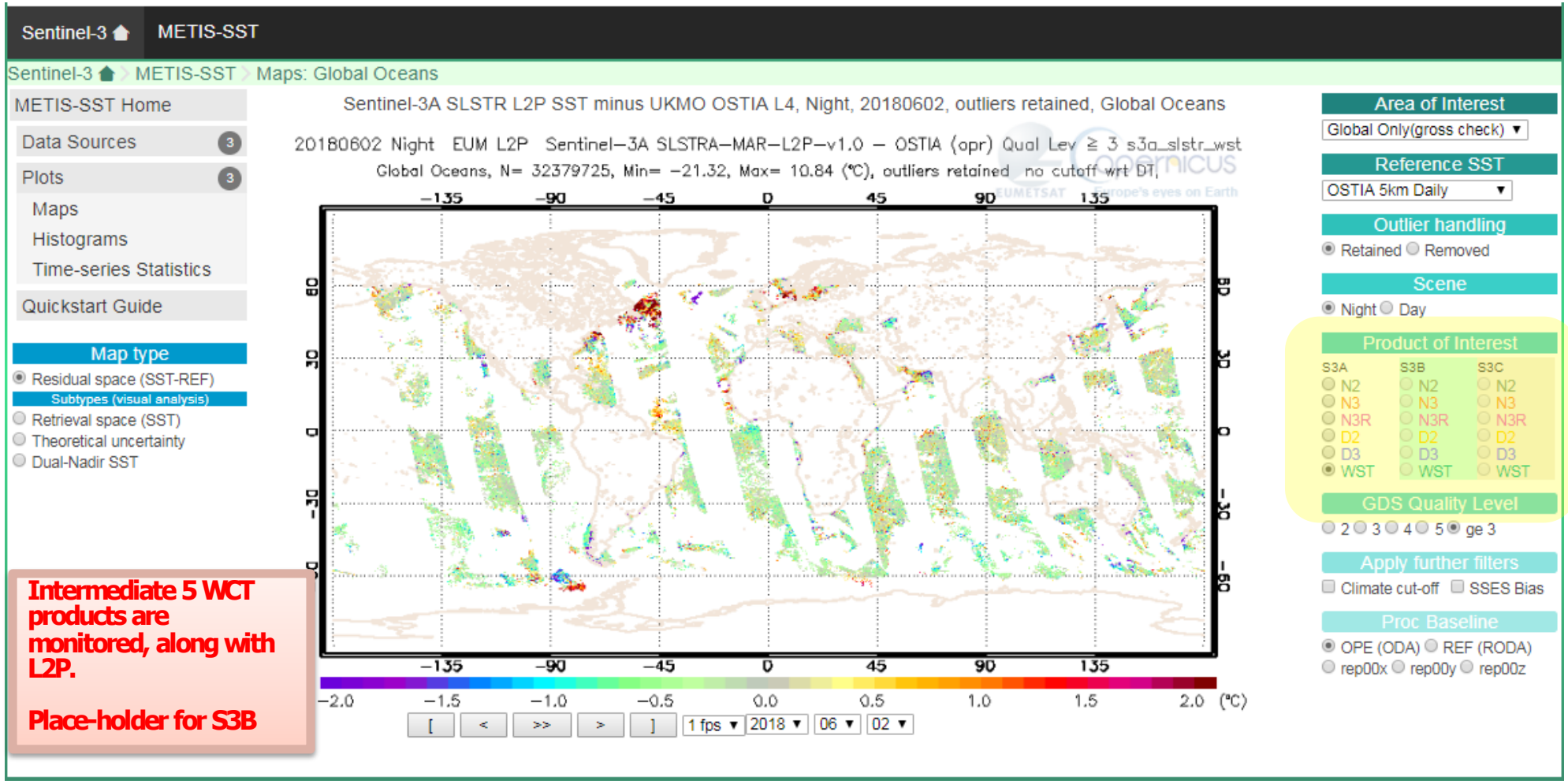
- Peruvian coast
- Coastal El Nino, Feb-Mar 2017
- SST anomaly exceeding 5°C
- Caused intense flooding

1. Concept

2. METIS
    1. Online interface and diagnostic metrics. (Public and internal versions)
    2. A few case studies
    3. Spin-offs, extreme events

3. Further plans with Sentinel-3 A/B/C
    1. Extend METIS-SST
    2. EUM RSP / NOAA SOCD collaboration
    3. OceanWatch Monitor (OM) – sneak preview

Sentinel-3A / B / C – further plans
METIS internal (on GSES)

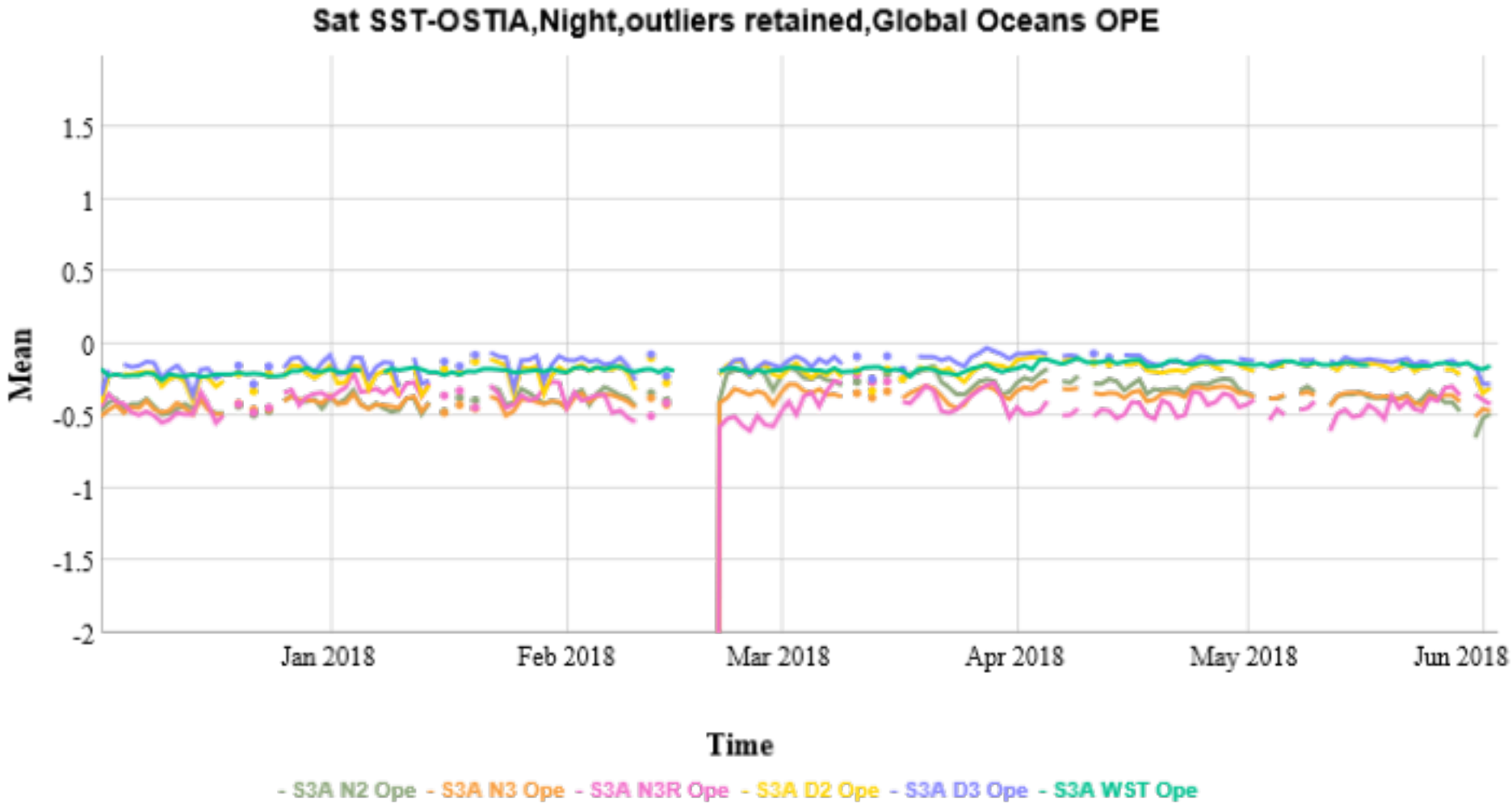


Intermediate 5 WCT products are monitored, along with L2P.

Place-holder for S3B

The final distribution product type of S3 SSTs is called as Water Surface Temperature (WST), which is an agglomerate of five different internal products. These five intermediate SST types optimize the use of combining different channels and angles (nadir and oblique): nadir 2-channel (N2), nadir 3-channel (N3), nadir 3-channel aerosol robust (N3R), dual-view 2-channel (D2) and dual-view 3-channel (D3).

Sentinel-3A / B / C – further plans
METIS internal (on GSES)



Sentinel-3A / B / C – further plans
NOAA STAR SOCD OceanWatch Monitor – Poster #7

File Edit View History Bookmarks Tools Help

NOAA OceanWatch Monitor | NOAA CoastWatch/OceanWat

https://www.star.nesdis.noaa.gov/socd/om/

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Oceanwatch Monitor (OM)

Satellite data products for understanding and managing our oceans and coasts

Oceanwatch | Ocean Color | Sea Surface Height | Sea Surface Salinity | Sea Surface Temperature | Sea Surface Wind | About

Oceanwatch > OM > SSH Home

- Oceanwatch Monitor
- Data and Regions 3
  - Satellite Products
  - Reference Data
  - Regions of Interest
- Intra-thematic Plots 4
- Inter-thematic Plots 3
- Event Media (future)
- On-Demand (future)
- 20-min Quickstart Guide

Partners & collaborators

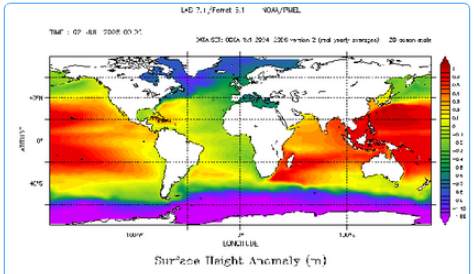
EUMETSAT, Copernicus, NASA, esa

NOAA SOCD Enterprise Oceanwatch Monitor (OM)

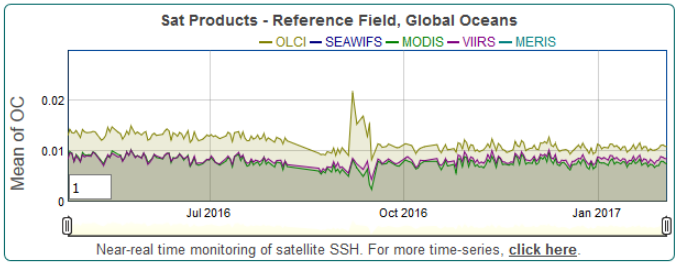
The Oceanwatch Monitor **(OM)** provides a first look at the performances of products ingested in the Oceanwatch systems. These remotely sensed products include: **Sea Surface Temperature (SST)**, **Ocean Color (OC)**, **Sea Surface Height (SSH)**, **Sea Surface Salinity (SSS)** and **Sea Surface Wind (SSW)**.

Sea Surface Height

Satellite altimeters use active radar to observe the surface height of the ocean which is not smooth or flat. Fluid hills and valleys deviate from a reference (mean geoid) height at the ocean surface. These vertical gradients are of interest for sea level rise, storm predictions, ocean currents, ecosystem ecology and other applications.



Latest SSH (click on image to enlarge). More maps, click here.



Near-real time monitoring of satellite SSH. For more time-series, click here.

Department of Commerce
National Oceanic & Atmospheric Administration
Center for Satellite Applications and Research
Satellite Oceanography & Climatology Division

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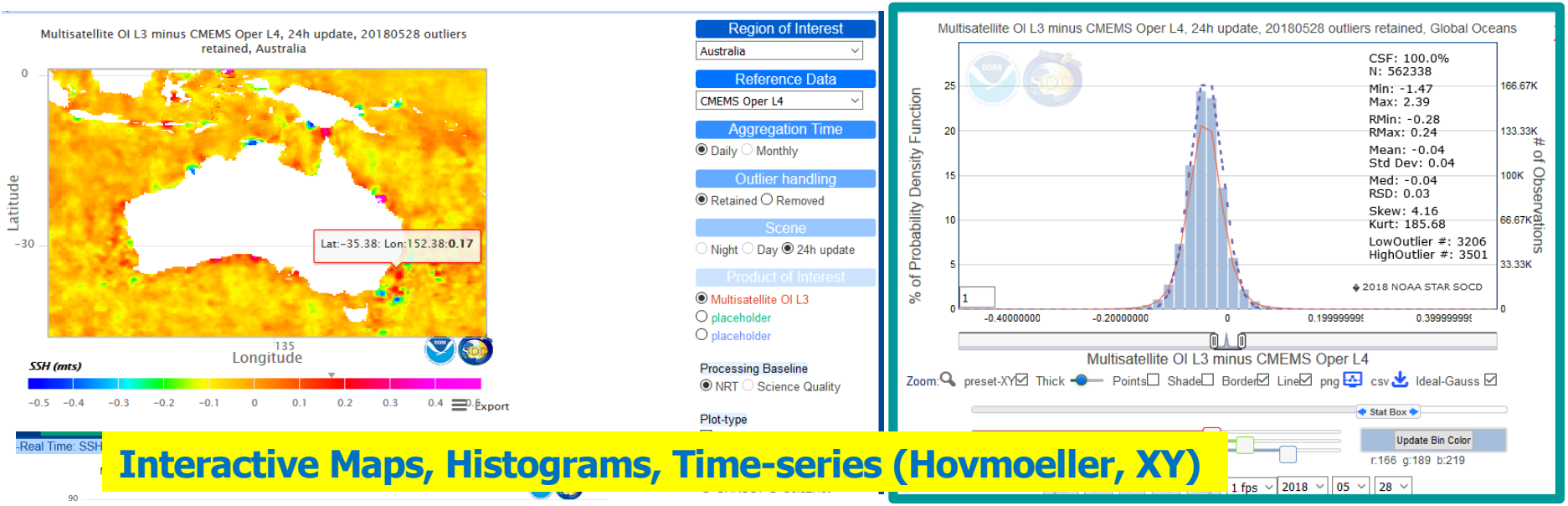
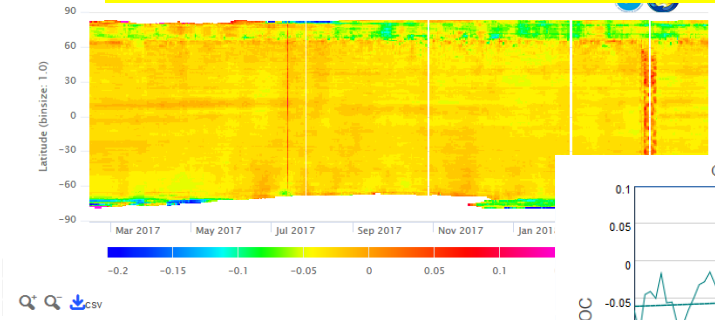
Type here to search 12:08 PM 5/30/2018

EUMETSAT METIS

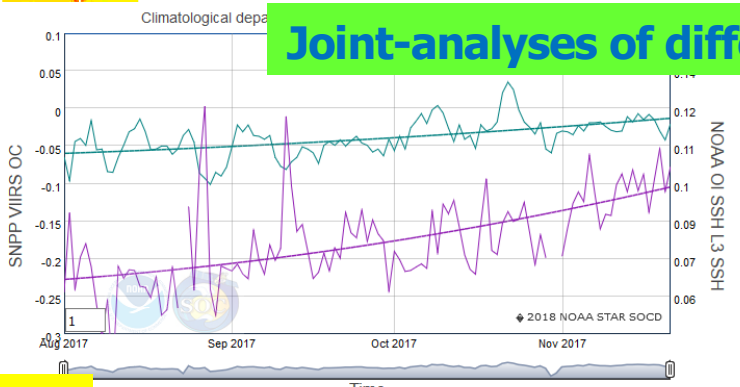
Sentinel-3A / B / C – further plans
NOAA STAR SOCD OceanWatch Monitor – Poster #7

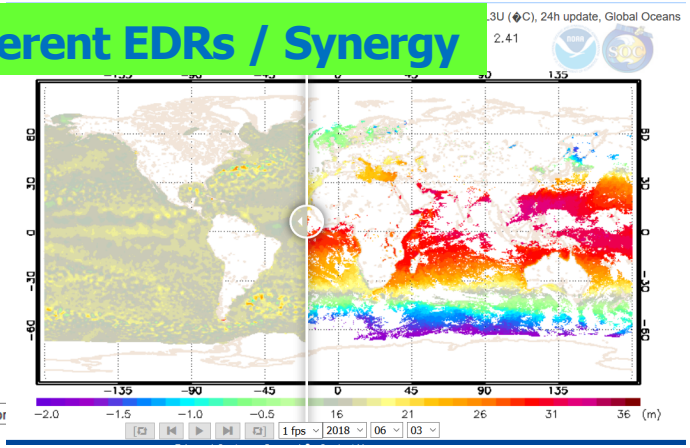


Interactive Maps, Histograms, Time-series (Hovmoeller, XY)



Joint-analyses of different EDRs / Synergy





Plan on including Sentine-3 A/B SST, OC, Altimetry (NOAA SOCD / EUM RSP)

EUMETSAT METIS

Sentinel-3A / B / C – further plans
EUMETSAT RSP / NOAA STAR SOCD plans

First International Operational Satellite Oceanography (OSO) Symposium, 18-19 June 2019, Washington DC area

The First Operational Satellite Oceanography Symposium aims to enable the understanding the barriers (perceived or actual) and facilitate the widespread incorporation of satellite ocean observations into the value chain from data to useful information across the range of operational applications. In this symposium, an international community of satellite operators, information producers and users will exchange facts and ideas to 1) understand user needs and expectations, and 2) develop interoperability standards and establish best practices that will lead to more universal use of ocean satellite data.

NOAA EUMETSAT

STEERING COMMITTEE

Bojan Bojkov (EUMETSAT)
Christopher Brown (NOAA)
Paul DiGiacomo (NOAA)
Veronica Lance (NOAA)
Francois Montagner (EUMETSAT)

Posted 24 May 2018 – More details to follow

https://coastwatch.noaa.gov/OSOSymposium

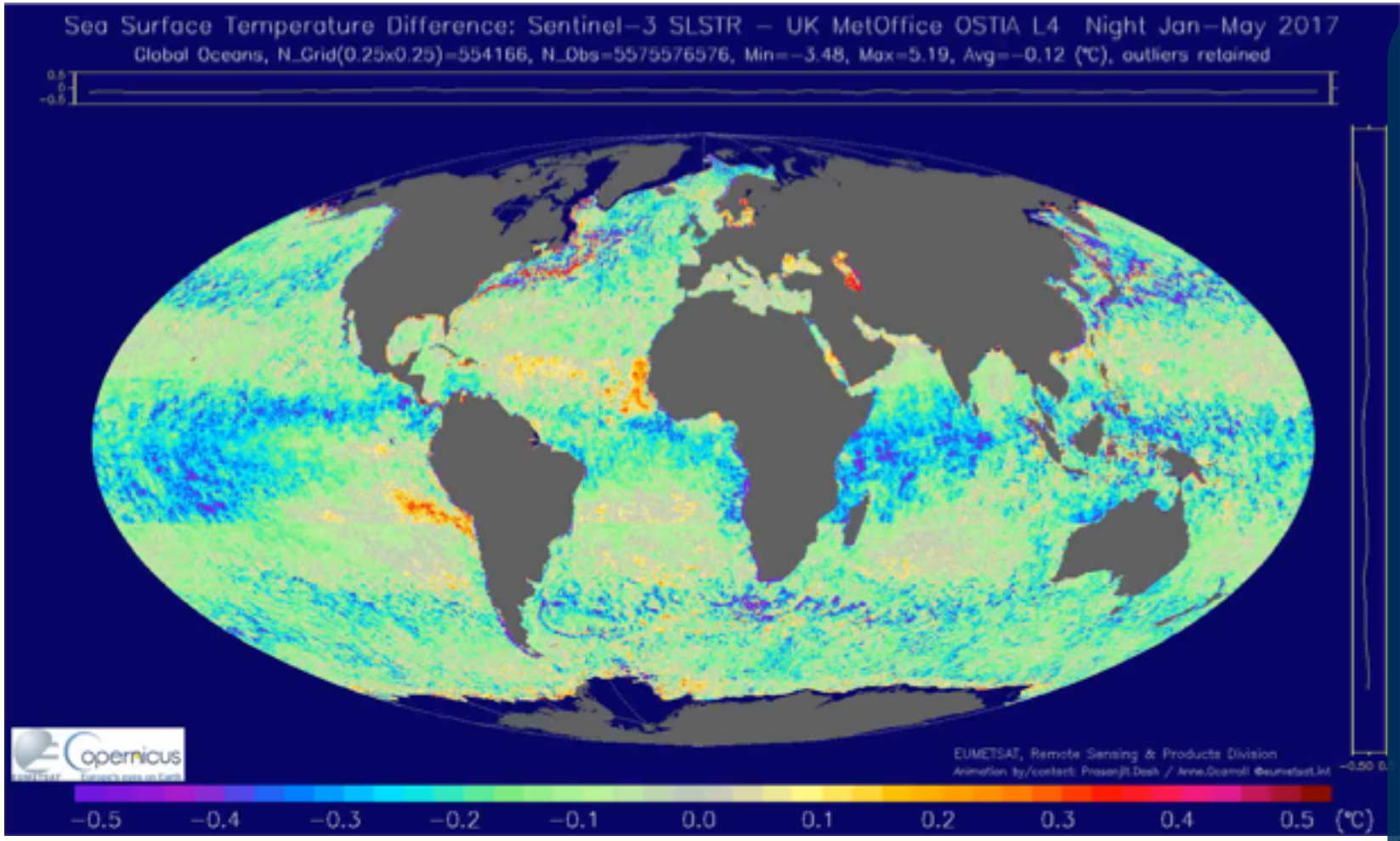
- Back-up

S3A SLSTR SST - OSTIA

The Problem Statement

METIS

Difference space



L1B

SCIENTIFIC CHALLENGES

Inverse algorithm

Cloud detection

Monitoring evaluation

(roles are interwoven) [Monitoring System can evaluate above two]

EUMETSAT METIS