

SENTINEL-3 SLSTR MONITORING AT EUMETSAT – THE PLAN

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#6 Group B

1. Background (concept and need of a monitor)

• The concept is inspired by the **NOAA** SST Quality Monitor (SQUAM) (Dash *et al.*, 2010) with a focus on Sentinel-3A **SLSTR** SST product(s) under the **Copernicus** program. For benchmarking and development purposes, EUMETSAT operational Metop-B AVHRR and IASI SST products are also included. The idea has progressed from a past EUMETSAT Vis. Scientist activity of P. Dash, from NOAA to EUMETSAT.

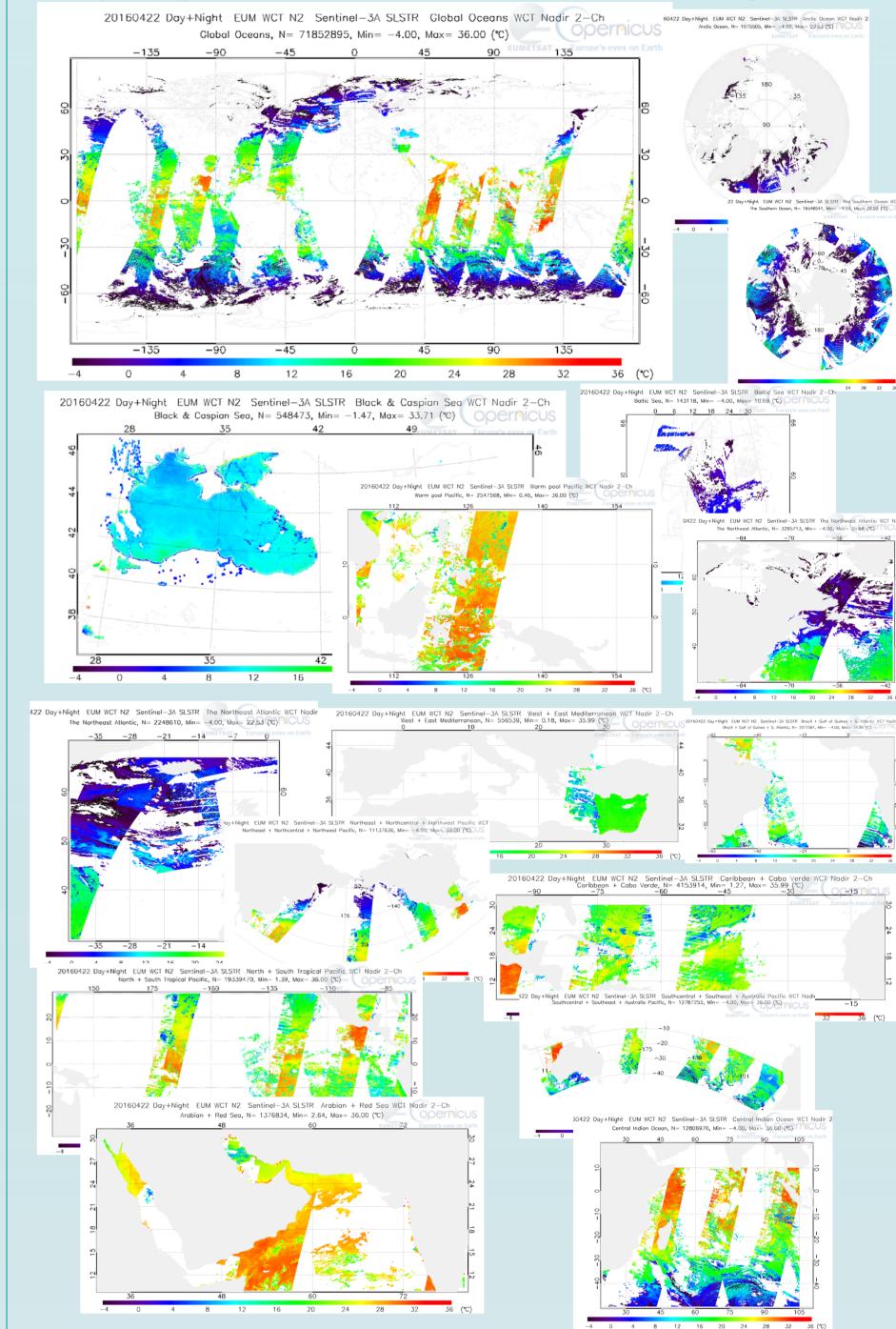
- The S3 Monitor has an enhanced ability to perform both Global and Regional analyses. The choice of regions is flexible, but based on the OSI SAF classification, **15** oceanic regions of interest (**ROI**) have been pre-selected (Fig. 1).
- The system is **Scalable** and **Flexible** for testing of third party data streams, if required (*e.g.*, AMSR-2, HY-2A *etc*).
- The comparison of S3 SSTs with those from other advanced

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EUMETSAT	MONITOF	RING WEATHER AND	Nam CLIMATE FROM SPACE		e Mo	nitor - TBD		Logo				
SST Monitor	Radiance Monito	or EDR-3 (pla	ceholder) ED	R-4 (placeholde	er) Aboı	it s						
Monitor > Product S	Summary											
ummary	Level-2 Satellite	SST Produc	ts									
	Satellite L2 SST	Nadir FOV	Production (b	y provider)	der) Cloud & Quality Flags Document, Data			t, Data Access & Contact	e 2 @			
S	Infrared Atmosphe	eric Sounding Int	erferometer (IAS	i) - EUMETSAT/O	SI SAF							
ependence	Metop-B IASI	~12km	19-Jan-2016 on		3 Cloud Tests: collocated AVHRR, RTM/NWP, ANN Quality Flags: 3:suspect 4:acceptable 5:excellent		Link FTP 1 FTP 2 Product manual Contact Product Navigator OSI SAF User Manual					
ler	Advanced Very High Resolution Radiometer (AVHRR) - OSI SAF											
	Metop-B AVHRR	~1km	19-Jan-2016 on		Threshold-based Cloudmask: MAIA (Lavanant, 2007) 🛃 Normalized Proximity Flags: 3:suspect 4:acceptable 5:excellent		Link FTP 1 FTP 2 Product manual Contact		Contact			
	Sea and Land Surface Temperature Radiometer (SLSTR) - ESA/EUMETSAT											
	Sentinel-3A SLSTR Sentinel-3B SLSTR	~1km	May-2016 on Jan-2018 on (future, TBD)		Threshold-based Cloudmask: Bayesian (REPORT/ATBD, 20XX) 🛃 Normalized Proximity Flags: 3:suspect 4:acceptable 5:excellent		Link FTP (test data) Product manual Contact		Contact			
	Reference SST and Match-up Procedure											
	Reference SST	Resolution	Time covera	Time coverage Inputs			Further info 🖉 ± @					
	Canadian Meteorol	ogical Centre 0.1 o	deg L4 SST (CMC)									
	CMC 0.1	0.10 deg (~6km	ı), Daily	01-Jan-2016 on N		R: AVHRR, VIIRS, WindSat /W: AMSR-2 nsitu: yes; CMC ice		Link FTP Publication Cor	ntact			
	UK MetOffice Operational Sea Surface Temperature and Sea Ice Analysis (OSTIA)											
	OSTIA Opr	0.05 deg (~6km), Daily		Apr-2006 on	N	R: AVHRR, VIIRS, WindSat /W: AMSR-2 nsitu: yes; CMC ice	Link FTP Publication Contact		ntact			
	Climate	0.05 deg (~6km), Daily × 0.25 deg (~25km), Daily × 0.25 deg (~25km), Monthly √		Climatological Avg		OSTIA daily analysis ce values also averaged		Personal communication Contact				
	In situ SST data match-ups from MeteoFrance											
	CORIOLIS		DD-MON-YYY	DD-MON-YYYY on Drifters; Moored buoys; Argo floats			Link FTP Documentation	Contact				
	Match-up: L4 matches are per date, bilinear interpolation. CORIOLIS insitu are for <±X km ±Y min>											
	PARTNERS & COLLABORATORS:											

2. S3A SLSTR SST facts (related presentations)

• Sentinel-3A was launched on 16 Feb 2016. S3A SLSTR SST in GHRSST Data Format Specification (GDS) L2P format will be provided, as is available. See *Poster-32* by O'Carroll et al. (this meeting) for further details: "Sentinel-3 marine centre and operations of SLSTR SST". See also Posters 48 and 49 (Tomazic *et al.*, this meeting).

Early images of S3-A SLSTR SST for 16 ROIs, 22-April-2016



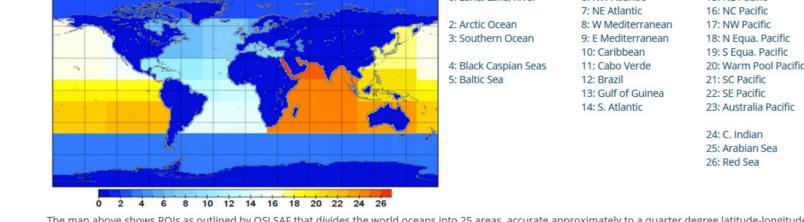
polar sensors, such as NPP VIIRS is out of the scope of this work and will be carried out under related validation activities (S3VT), where strategic partners have shown interest for a collaborative work, such as NOAA SQUAM.

Why an S3 SST Monitor is needed?

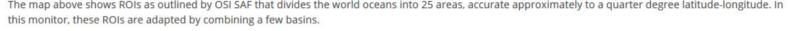
• Evaluate the performances of S3 SST products in quasi nearreal time (NRT). These include: SST algorithm, Retrieval domain, Cloud-detection, unforeseen Operational issues (not listed), Inter-comparison with OSI SAF Metop-B SSTs, and **provide feedback** for further product improvement.

How the implementation will be made?

- Automated quasi-NRT, Global and Regional
- Basic analyses (visual inspection) in the state space (T_s) and in-depth analyses (visual and statistical) in the difference space, *i.e.*, deviations from a set of references: $\Delta T_s = T_s - T_{RFF}$.
- The choice of T_{RFF} (*in situ* and Level-4 fields):
- Validation (vs. in situ); matches will be generated by Felyx (www.felyx.org) under a federated project with the OSI SAF. The space-time window needs to be determined using a sensitivity study (*cf.*, Dash *et al.*, 2015).
- Monitoring and cross-consistency checks (vs. L4s: CMC 0.1°, OSTIA 0.05°, OSTIA monthly climate)



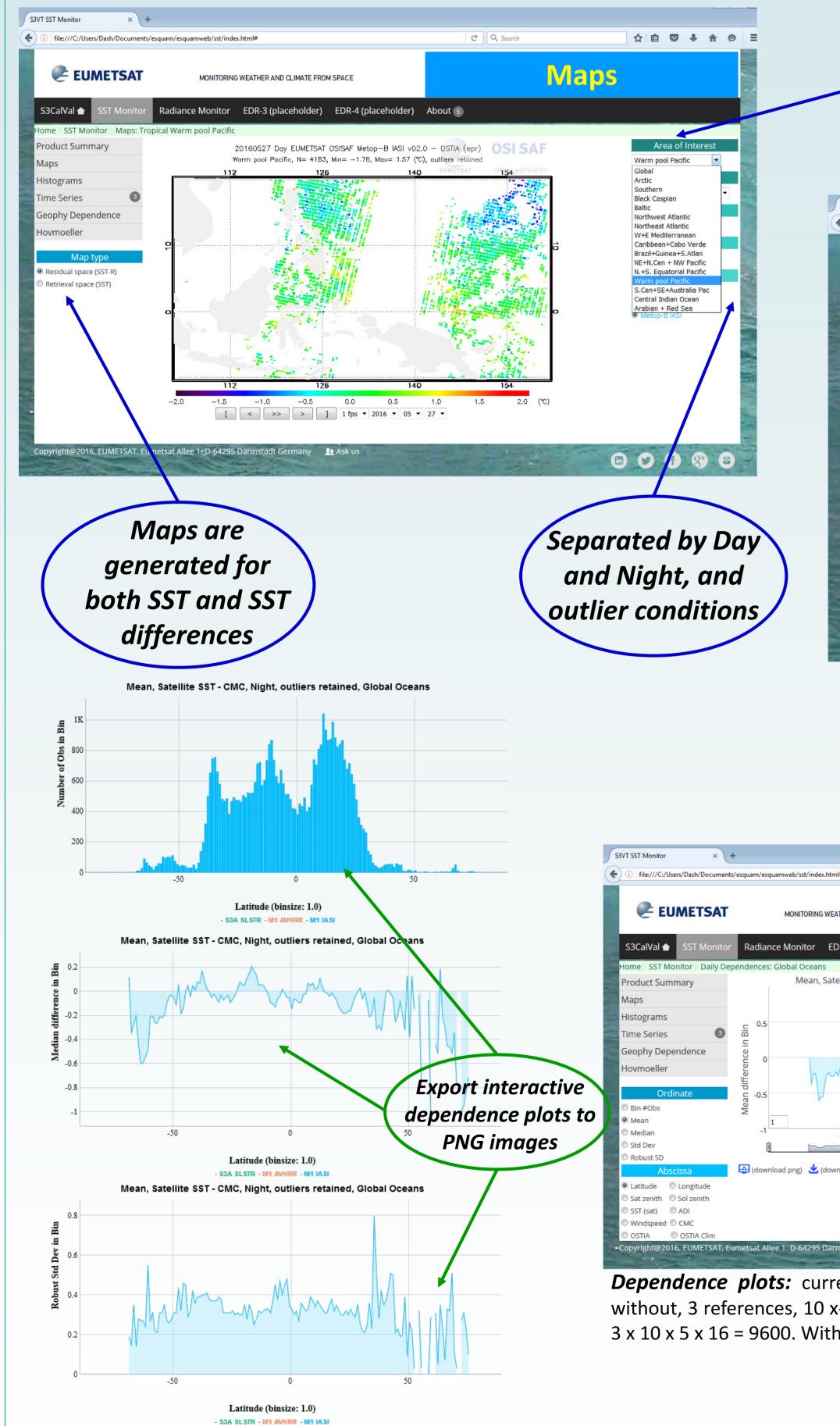


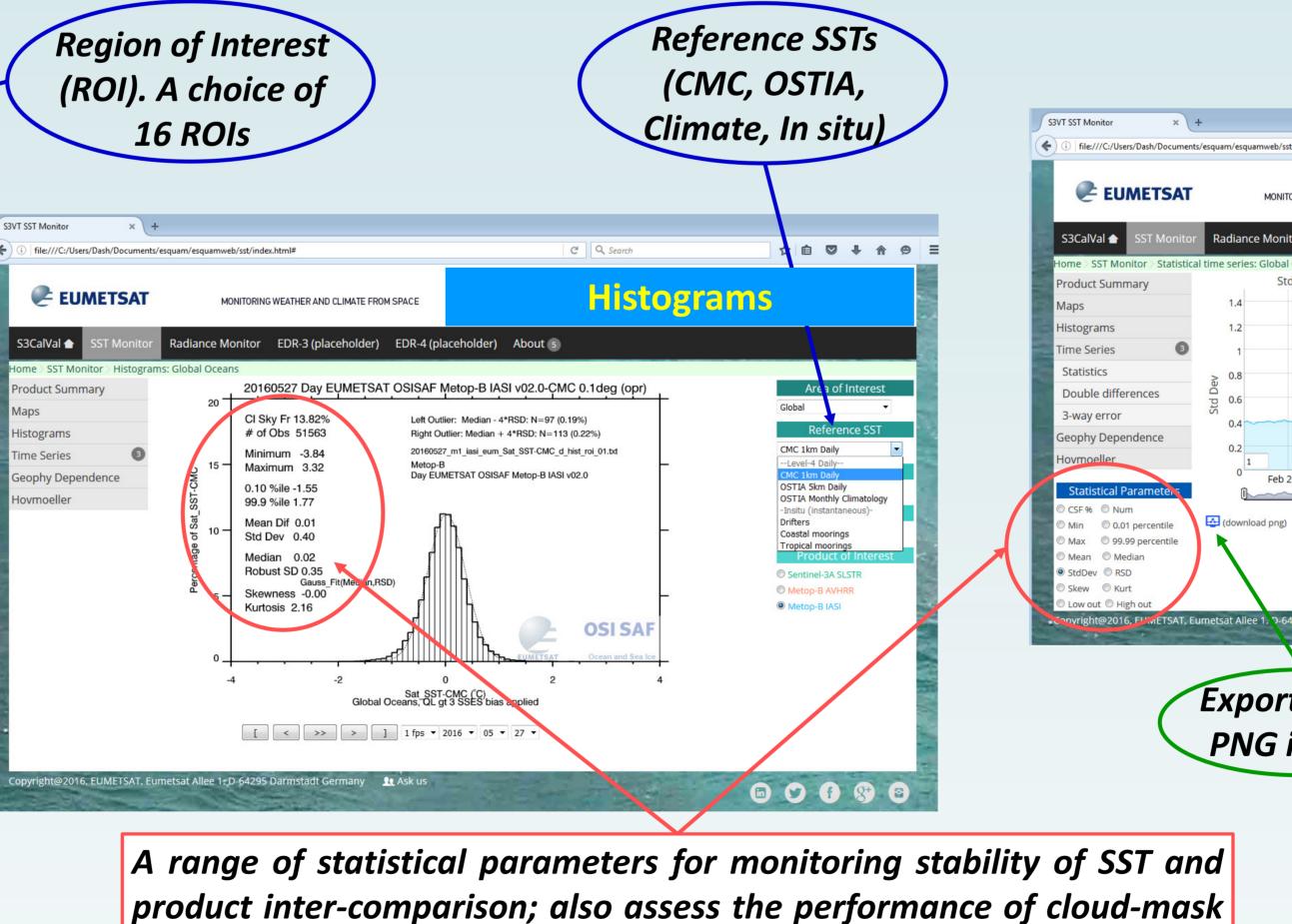


01	Name	≡OSI SAF	Lat range	Lon range	Lon (0-360)	Importance
1	Global	global	90 N - 90 S	180 W - 180 E	0 - 360	overall performance
2	Arctic	2	90 N - 63 N	180 W - 180 E	0 - 360	shallow, icy, low evap
)3	Southern	3	40 S - 79 S	180 W - 180 E	0 - 360	cold + warm mixing
04	Black Caspian	4	47 N - 37 N	27 E - 55 E	27 - 55	largest enclosed inland
05	Baltic	5	67 N - 50 N	2 E - 31 E	2 - 31	large brackish water
06	Northwest Atlantic	6	67 N - 30 N	40 W - 95 W	265 - 320	slope waters, Gulf stream
07	Northeast Atlantic	7	67 N - 30 N	40 W - 2 E	320 - 2	biodiverse, thermohaline
08	West + East Mediterranean (exclude Atlantic & Black Sea from the box)	8+9	46 N - 30 N	6 W - 37 E	354 - 37	land-enclosed high evaporation & salinity
09	Caribbean + Cabo Verde	10+11	30 N - 9 N	98 W - 9 W	262 - 351	Saharan dust
10	Brazil + Gulf of Guinea + S. Atlantic	12+13+14	10 N - 40 S	63 W - 20 E	297 - 20	warm current, oil & gas
11	Northeast + Northcentral + Northwest Pacific	15+16+17	67 N - 10 N	106 E - 82 W	106 - 278	subtropical gyre, CO ₂ sink
12	North + South Tropical Pacific	18+19 (ext)	30 N - 30 S	134 E - 76 W	134 - 284	El Niño (La Niña), Niño 4 & 3
13	Warm pool Pacific	20	20 N - 10 S	105 E - 160 E	105 - 160	warmest (local) SST
14	Southcentral + Southeast + Australia Pacific	21+22+23	10 S - 40 S	105 E - 70 W	105 - 290	subtropical gyre
15	Central Indian Ocean	24	10 N - 40 S	20 E - 105 E	20 - 105	warm ocean
16	Arabian + Red Sea	25+26	31 N - 10 N	32 E - 80 E	32 - 80	Monsoon, dust, Oil & gas

Fig. 1: A proposed webpage for monitoring of Sentinel-3 SLSTR SSTs. For the purposes of benchmarking, EUMETSAT operational Metop-B AVHRR and IASI SSTs will also be included. The concept is inspired by the NOAA SST Quality Monitor (SQUAM). For oceanographic analyses, monitoring will be performed for Global and 15 Regional areas of interest (ROI) as outlined above. Besides SST, the monitor is flexible enough to be adapted for other products (e.g., Ocean Color), if deemed necessary, and placeholders are created (see top banner).

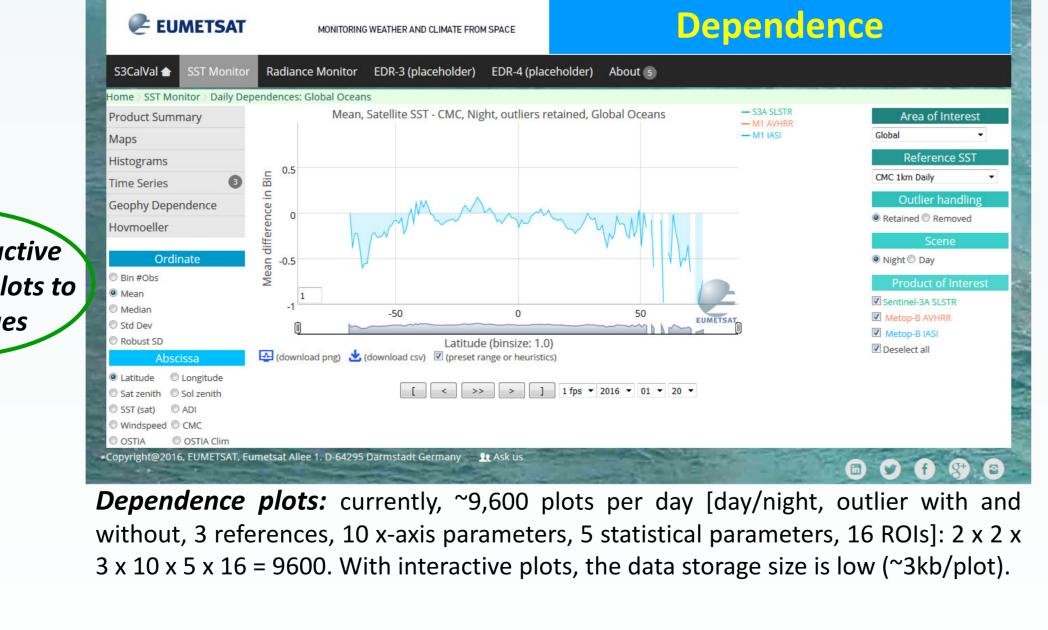
3. Metop-B IASI SST in S3 Monitor (as a prototype)





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Interactive plots file:///C:/Users/Dash/Documents/esquam/esquamweb/sst/index.html# C Q Search ☆ 自 ♥ ↓ Time series MONITORING WEATHER AND CLIMATE FROM SPACE adiance Monitor EDR-3 (placeholder) EDR-4 (placeholder) About s Std Dev, Satellite SST - CMC, Day, g liers retained, Global Oceans S3A SLST Area of Interes - M1 AVHR - M1 IAS CMC 1km Daily Retained Removed 🔍 Night 🔍 Day Sentinel-3A SLSTI Feb 2016 Mar 2016 Apr 2016 May 2016 Metop-B AVHR Metop-B IAS 🛿 (download png) 🛛 📩 (download csv) 🛛 🖾 (preset range or heuristics) ovright@2016, EUMETSAT, Eumetsat Allee 1. 2-64295 Darmstadt Germany 📃 👥 Ask us 6 0 6 🖗 6 Exportable to (Un)select PNG images products Download as CSV Range slider algorithm and data coverage, e.g., clear-sky fraction percentage (CSF).



C Q Search

4. Summary and outlook

• Work is in progress to set a comprehensive 360° view monitoring tool, for Copernicus Sentinel-3A SLSTR SST products. For comparing against a benchmark, two operational EUMETSAT products will be also included, Metop-B AVHRR and Metop-B IASI.

• Initial prototype with Metop-B IASI SST is being tested to develop the infrastructure.

References

• Dash, Ignatov, Kihai, Sapper (2010), The SST Quality Monitor (SQUAM), J. of Atm. & Oceanic Tech, 27(11), 1899-1917.

• Dash, Ignatov, Kihai, Petrenko et al. (2015), Validation of SST against in situ data: effect of space-time collocation criteria, The 16th GHRSST Science Team Meeting, 20-24 July, 2015, ESA/ESTEC, The Netherlands.

Acknowledgments

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The 17th International GHRSST Science Team Meeting (GHRSST XVII) - Washington DC, USA - 6th to 10th June 2016. Contact: prasanjit.dash@eumetsat.int