Sentinel-3A SLSTR Cal/Val activities at EUMETSAT

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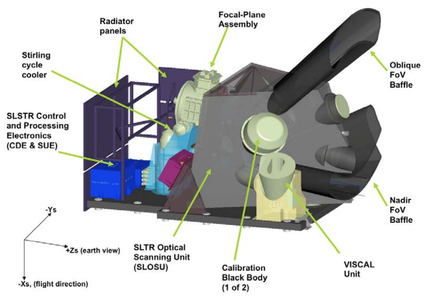
Introduction

Sentinel-3A (S3) Mission Performance Framework (MPF) Activities span contributions from European Space Agency (ESA), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), Sentinel-3 Validation Team (S3VT) and from Sentinel-3 Mission Performance Centre (MPC). During both Commissioning (E1) and Routine Operations (E2) phases EUMETSAT is contributing as defined in EUMETSAT Mission Performance Implementation Plan (EMPIP)[1] that is aligned with overall S3 Cal/Val activities [2].
Since we are still in the commissioning phase, we will give an overview of several main cal/val activities planned and implemented at EUMETSAT, with the focus on activities covering Sea and Land Surface Temperature Radiometer (SLSTR) instruments[3].
Some Cal/Val activities will be implemented through Mission Performance Monitoring Facility (MPMF) within Payload Data Ground Segment (PDGS), and others will be implemented using open source and in-house developed tools.

SLSTR

During the Commissioning phase, the main focus will be on Level 1 radiometric inter-comparisons of SLSTR infrared channels with Infrared Atmospheric Sounding Interferometer (IASI) which is adopted as an inter-calibration reference instrument by Global Space-based Inter-Calibration System (GSICS). Upon successful validation of Level 1 product, the focus will be on sea surface temperature (SST) validation using SST data from in situ and shipborne radiometers as well as from other satellite missions.

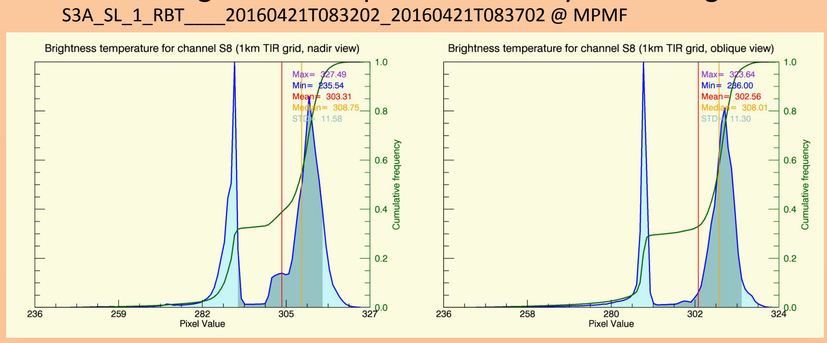


SLSTR

SLSTR-L1B-CV-220: Verification and monitoring of channel performance: dynamic range and noise characteristics

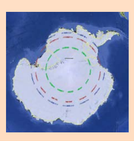
- Verify that SLSTR IR radiance measurements are within the specified dynamic range
- Verify and monitor the noise characteristics of SLSTR IR radiance measurements

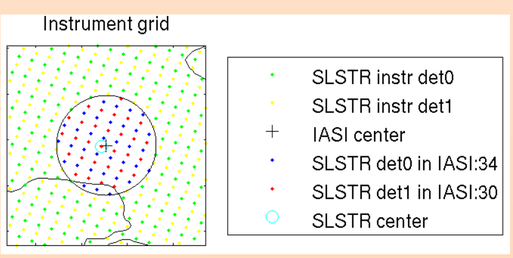
S3A_SL_1_RBT____20160421T083202_20160421T083702 @ MPMF

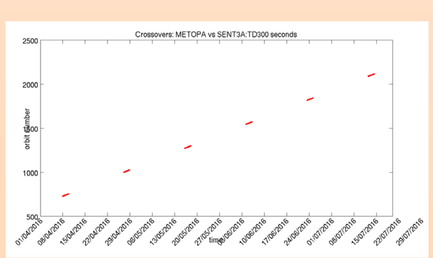


SLSTR-L1B-CV-270: Radiometric bias characterisation: Inter-satellite comparisons - MetopA/IASI/AVHRR with S3A/SLSTR

- find (quasi) SNO's between SLSTR and IASI/AVHRR (max 5 min; max 10 km; cos(a1)/cos(a2)-1)<0.01) – over the poles every cca 10-15 days –orbital model prediction; NAIAD
- Convolve IASI spectra with SLSTR SRF on image and on instrument grid (per detector)



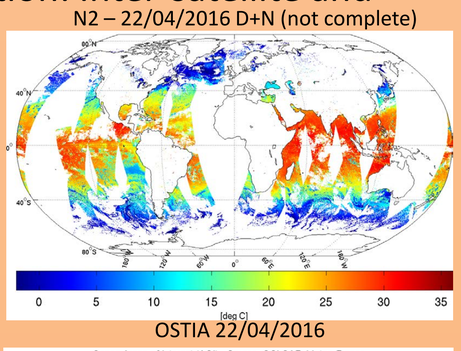




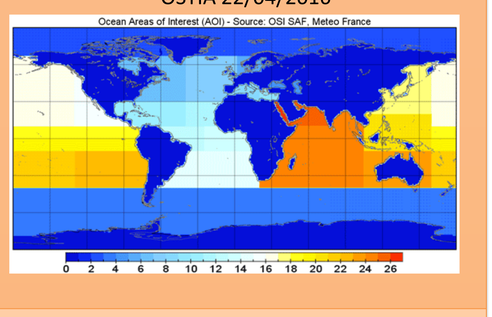
SLSTR-SST-CV-120/135: SST Bias Characterisation: Inter-satellite and inter-algorithm comparisons

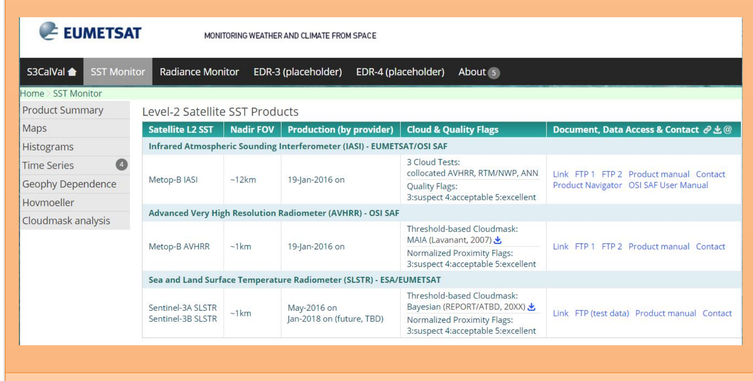
- Satellite comparison with OSI-SAF and CMEMS products
- Analysing individual algorithms and instrument characteristics
- Global and regional analysis, eventually routine
- Daily, monthly plots, maps, time-series, histograms, ...

N2 – 22/04/2016 D+N (not complete)



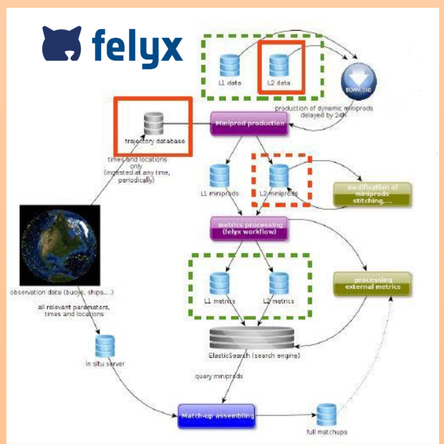
OSTIA 22/04/2016





SLSTR-SST-CV-130: SST Bias Characterisation: Comparisons with in-situ measurements

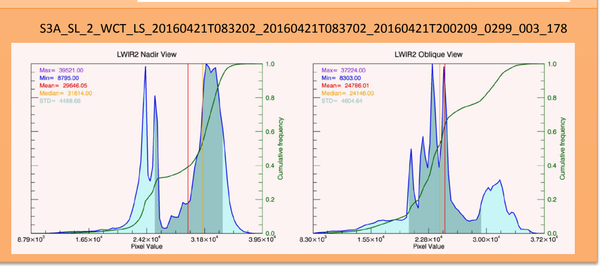
- Copernicus Coriolis *in situ* service: drifters on GTS, OceanSITES (Pirata, GTMBA, ...) , Argo GDAC, GTSPP
- Automatic collocations of SLSTR L1/L2 over in situ measurements and ship mounted radiometers (Felyx)
- OSI-SAF FA SLSTR MDB



SLSTR-SST-CV-160: Sensor Specific Error Statistics

- Derivation of SSES LUT using MDB (from SLSTR-SST-CV-130)

S3A_SL_2_WCT_LS_20160421T083202_20160421T083702_20160421T200209_0299_003_178

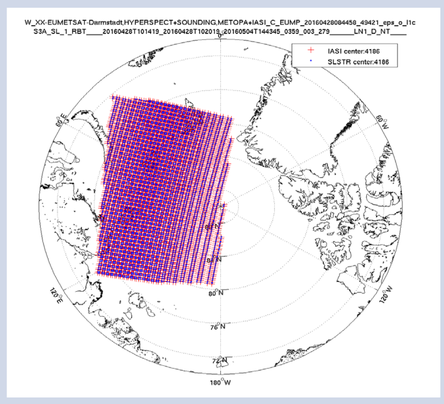


SLSTR-L1B-CV-270: SLSTR/IASI preliminary results

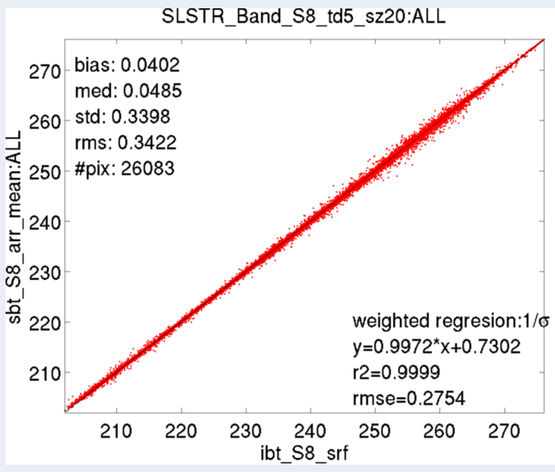
- 18 SLSTR IPF PDUs and IASI L1C
- 27-28.04.2016
- Time difference 5 min:
  pixel time abs(IASI-SLSTR central)

matchups (all IASI satza):
~60000 / ~5000 per crossover
matchups (abs(IASI satza)<20):
26083 / ~1500 per crossover

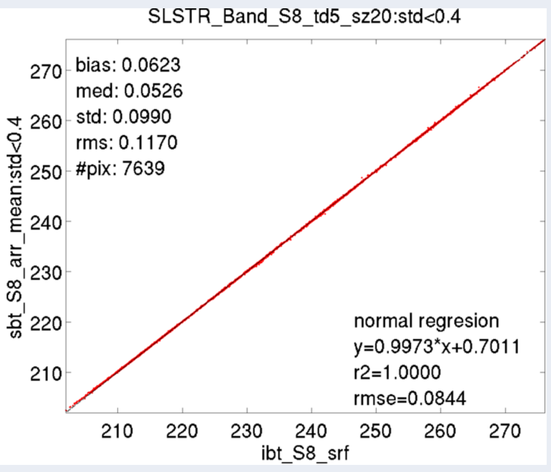
- IASI hyperspectral measurements convolved with SLSTR S8/S9 SRF
- Measurements are aggregated from multiple SLSTR pixels and geo-collocated within an IASI instantaneous fields of view (IFOV) (circle)

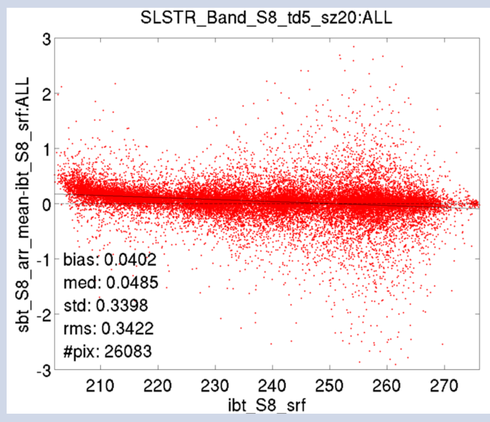


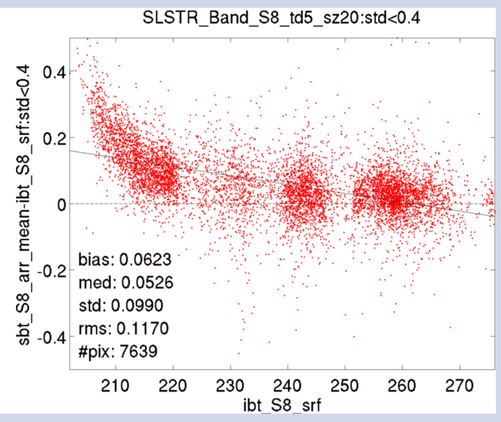
ALL pixels

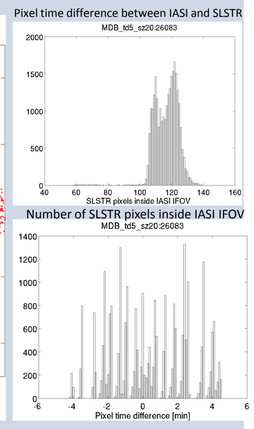


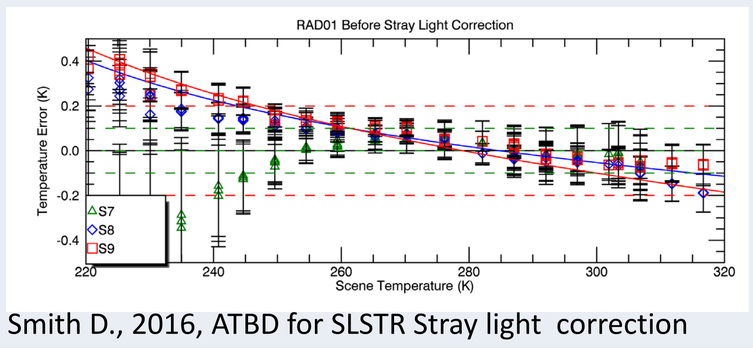
Homogenous pixels: σ<0.4

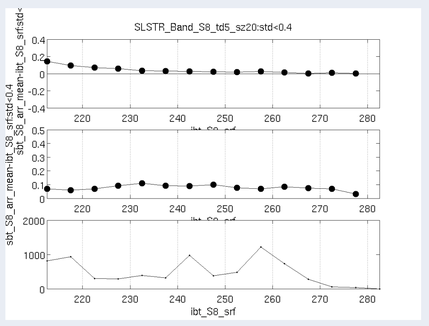












Smith D., 2016, ATBD for SLSTR Stray light correction

Next steps

- Implement stray light correction
- include SNO events: 07/04; 04/06; 23/06; 12/07
- IASI IFOV circle → ellipsoid
- Oblique view
- QUASI SNOs (NAIAD)– for >270 K
- Detector dependence
- 3.7 µm gap filling for Band 7
- MetopB: IASI&AVHRR
- SLSTR L0 (Fiduceo)

References

[1] EUMETSAT Sentinel-3 Mission Performance Implementation Plan (EMPIP), 2016, EUM/LEO-SEN3/PLN/14/756933, Issue v1C, pp.100
[2] Sentinel-3 Calibration and Validation Plan, 2014, Eumetsat/ESA, S3-PL-ESA-SY-0265, Issue 2, pp. 235.
[3] Donlon, C.J., B. Berruti, A. Buongiorno et al, The Global Monitoring for Environment and Security (GMES) Sentinel-3 mission, RSE, 120 (2012)
[4] Radiometric intercomparisons of AATSR and IASI, 2013, C. Whyte, D. Moore, J. Remedios

Acknowledgements

We would like to acknowledge The European Commission Copernicus Programme; The European Space Agency; Scientists and Industry throughout Europe. Special thanks to ESA and MPC/ESL collegues Jens Nieke, Philippe Goryl, Craig Donlon, Dave Smith, Gary Corlett, Ludovic Bourg, Claire Hanoc and to everyone in EUM S3-OPIT team.