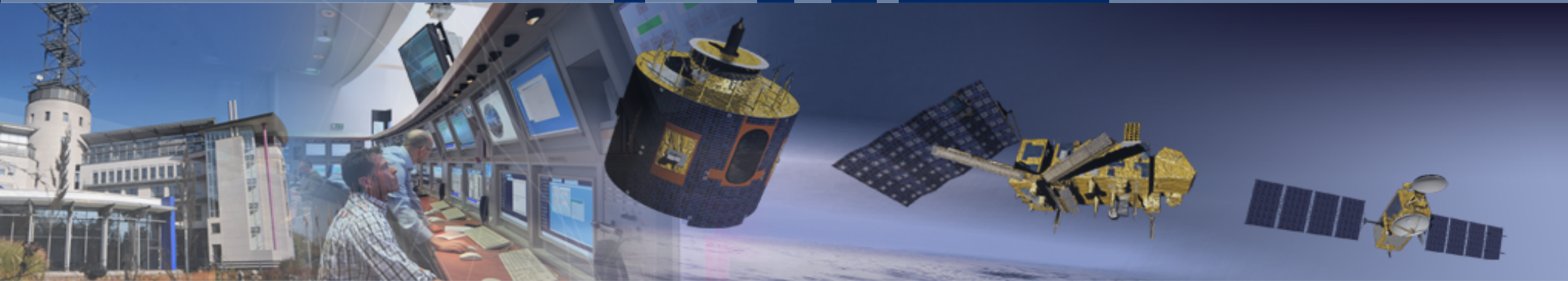




EUMETSAT

Monitoring weather and
climate from space



EUMETSAT and OSI-SAF report for GHRSSST



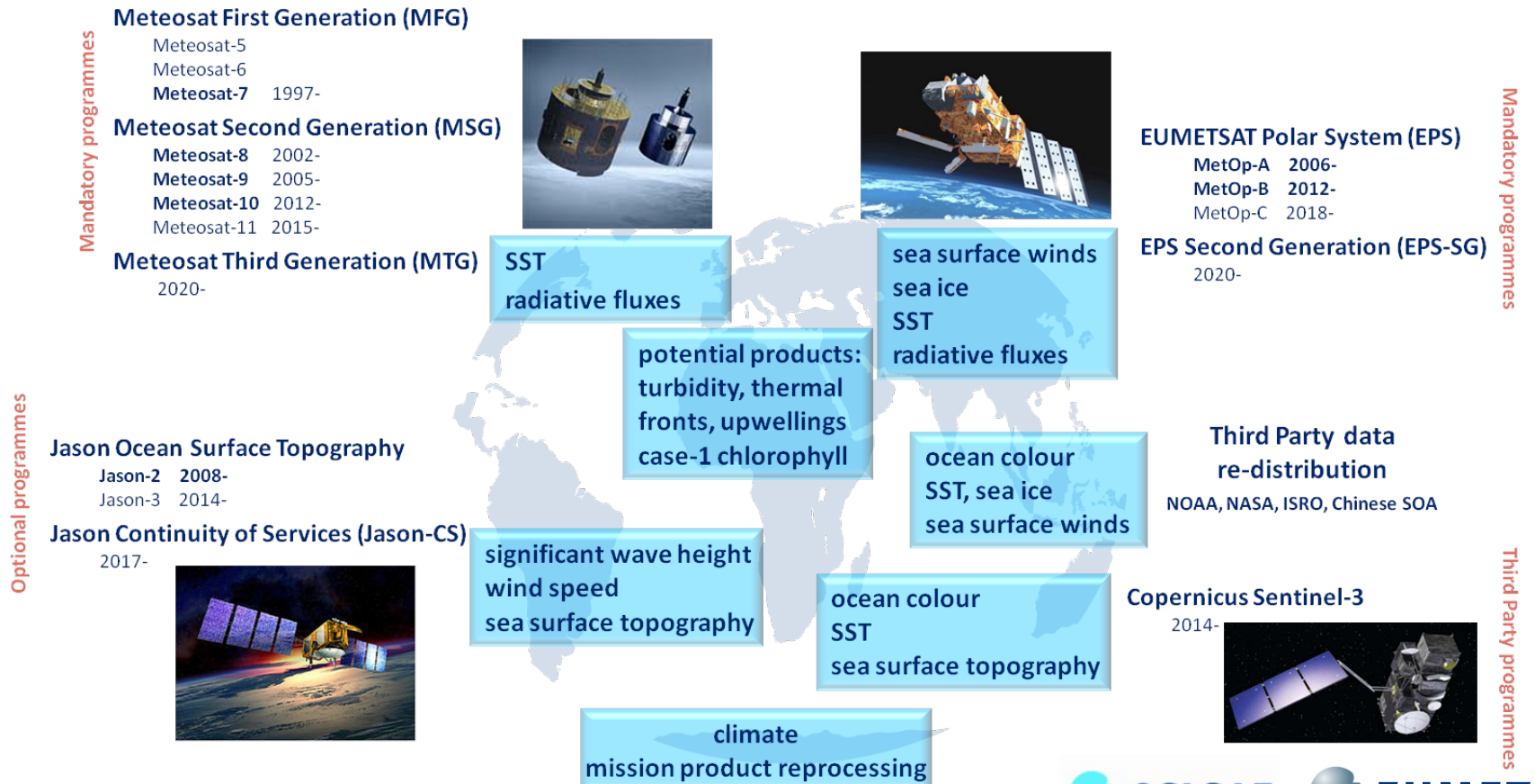
- ⤴ Update on EUMETSAT programmes related to SST
 - EPS (including IASI SST)
 - GSICS
- ⤴ OSI-SAF
- ⤴ Copernicus Sentinel-3
 - S3 marine centre
 - S3/SLSTR Cal/Val
 - SLSTR SST
- ⤴ 3rd party data activities



EUMETSAT - space data provider for operational oceanography

Operational data provider for services, environment, climate and science

User-driven programmes based on user requirements



Summary of SST missions at EUMETSAT

Most recent launches: MSG-3 (5th July 2012); Metop-B 17th September 2012

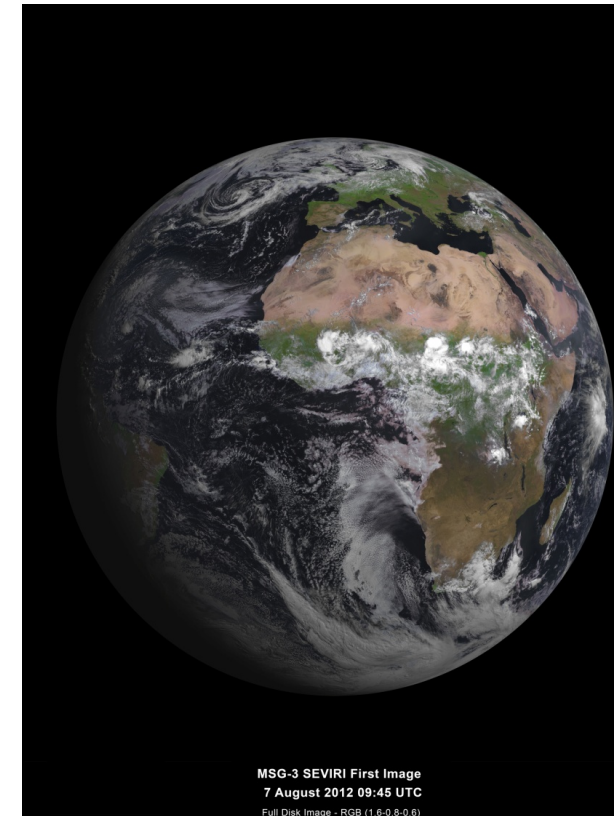
- Level-1 from EUMETSAT data centre (www.eumetsat.int)
- EUMETSAT OSI-SAF for Level-2 products (www.osi-saf.org)

Planned 2015 launches:

- MSG-4 (SEVIRI): 2nd July 2015
- Copernicus Sentinel-3 (SLSTR): July-Sept 2015
- [Jason-3 (Optional programme): March 2015]

Future:

- Metop-C (AVHRR, IASI): ~2018
- EPS-SG (MetImage, IAS): ~ 2020
- MTG-I1 (FCI): ~ 2018
- MTG-S1 (IRS): ~2020





Metop-A/B AVHRR and IASI



Level 1 AVHRR and IASI through EUMETSAT data centre

<http://www.eumetsat.int/Home/Main/DataAccess/index.htm?l=en>

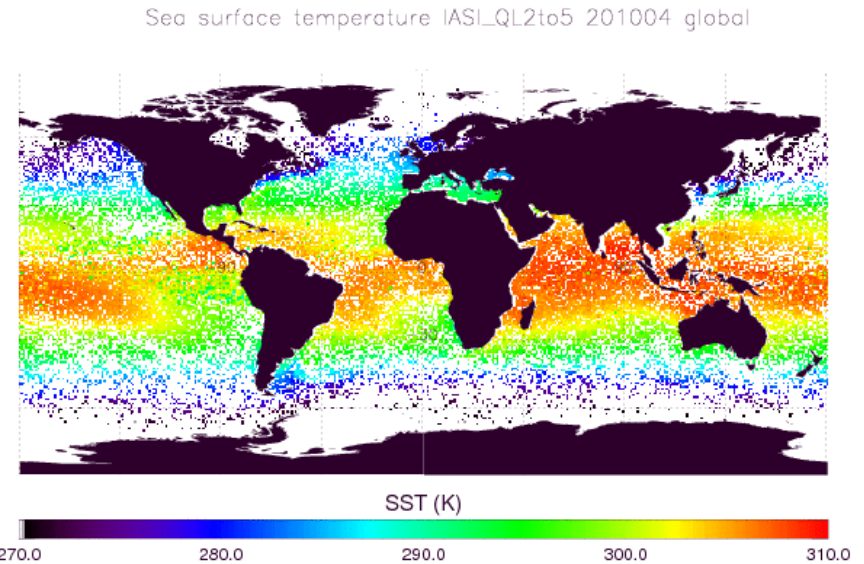
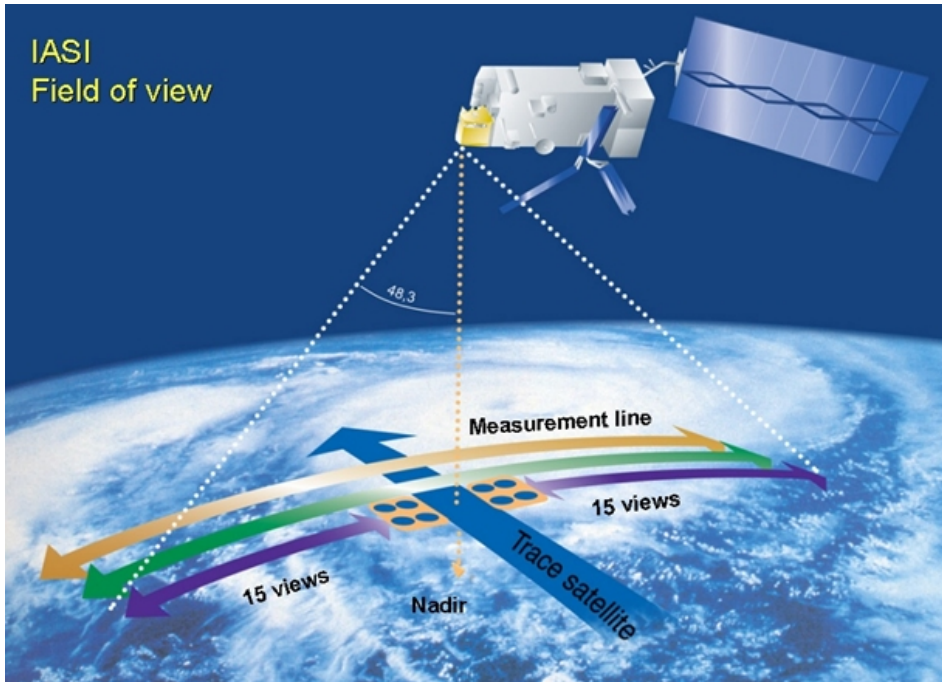
-> Update to AVHRR products: Inclusion of NeDT

AVHRR Level 2 products produced and delivered through EUMETSAT OSI-SAF

www.osi-saf.org

L2 IASI SST: L2Pcore from EUMETSAT; L2P (soon) from OSI-SAF

Metop IASI Sea Surface Temperature



- ✦ IASI L2Pcore, GHRSSST Data Specification version 2, contains:
 - Skin SST, SSES, ECMWF wind-speed
 - 'Core' product, as without ice, aerosol, background SST



IASI L2Pcore Sea Surface Temperature (EUM CAF)

IASI L2Pcore available from EUMETSAT data centre ftp site:

- Metop-A: 24th March 2011; Metop-B: 29th January 2014

Currently version 5 of IASI L2 processor (includes sounding data)

Version 6 planned for ~July 2014

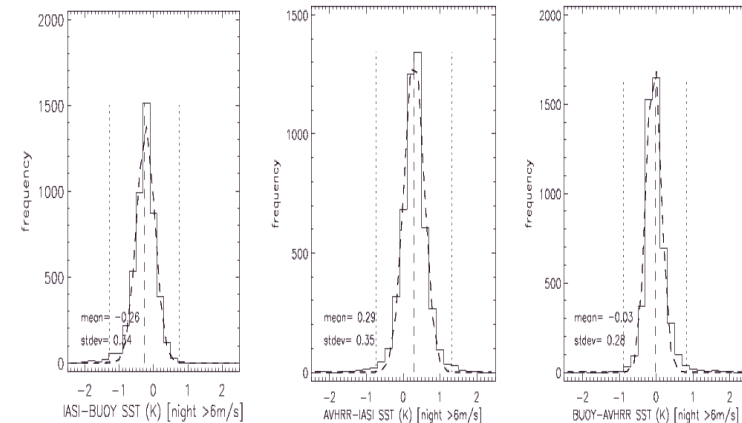
- New retrieval based on Piece Wise Linear Regression (PWLR) and 1D-VAR (Tim Hultberg, Thomas August).

- New SSES scheme implemented using observational uncertainties from PWLR

IASI L2P Sea Surface Temperature (OSI-SAF)

OSI-SAF to produce full IASI-A L2P

- With all auxiliary data included
- Review Q2 2014
- Initial validation results using IASI PPF V5; Pre-operational following bug-fix
- ~July 2014; Operational following further v6 validation



Validation using daily OSI-SAF MDB with AVHRR and in situ (ship, moored, drifters)

- Available since June 2013
- Buoy and AVHRR SSTs (37x37 AVHRR box)
- 3 hour temporal collocation

Validation conclusions and future developments

Validation:

- ⋄ Slight cool bias in v5 and v6 (less so) IASI SSTs (taken into account in SSES); Standard deviations less than 0.4K.
- ⋄ Preliminary 1D-VAR results (v6) show good results (biases less than 0.1K (stdev <0.37K) for Quality level 5 for both Metop-A/B.
- ⋄ Further SSES derivation (v6, 1DVAR) using further matchups (Q3,14)

Future:

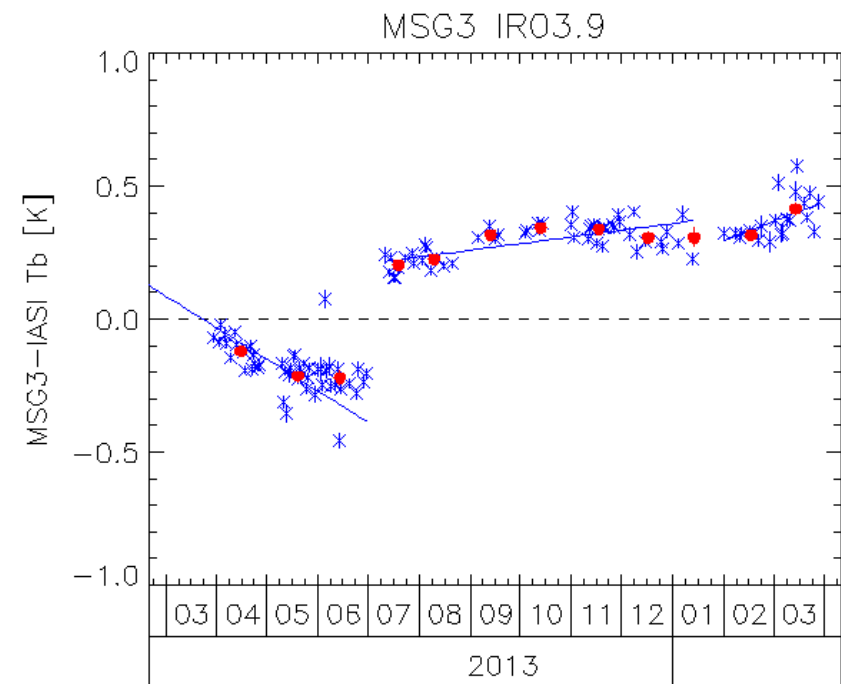
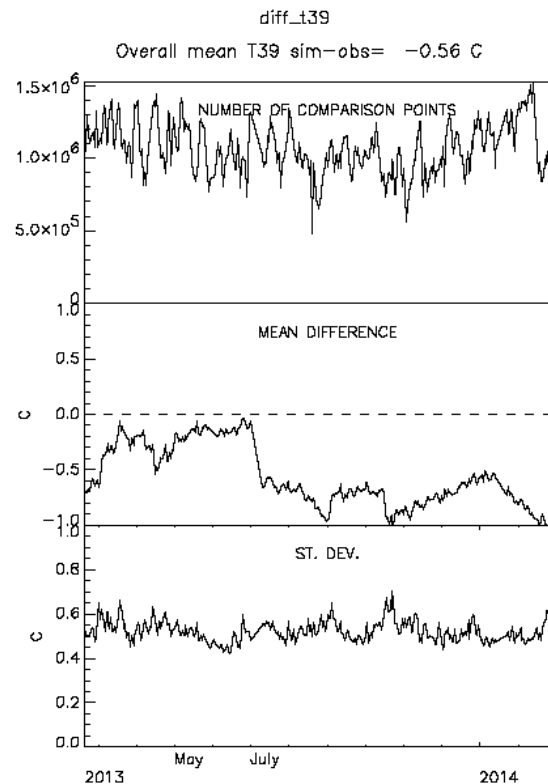
- ⋄ Tailored training set for skin SST and aerosol flagging
- ⋄ Consider inclusion of obs. uncertainties as 'experimental' field in L2P
- ⋄ OSI-SAF review completed Q2 2014: Pre-operational L2P after a correction when v6 is implemented (~July 2014); Operational after further v6 validation



GSICS: Independent bias monitoring of MSG-3 3.9 μ m channel

OSI-SAF bias monitoring using RTTOV; GSICS monitoring from www.eumetsat.int/website/home/Data/Products/Calibration/index/html

Independent bias monitoring of MSG-3 3.9 μ m channel. The larger differences in July 2013 in both plots, is thought to be due to a thin-film interference effect, which introduces varying biases on this channel due to the build up of ice on the optics, improving with age. See *Hewison et al, EUM conf, 2013*.



OSISAF SST 2013-2014

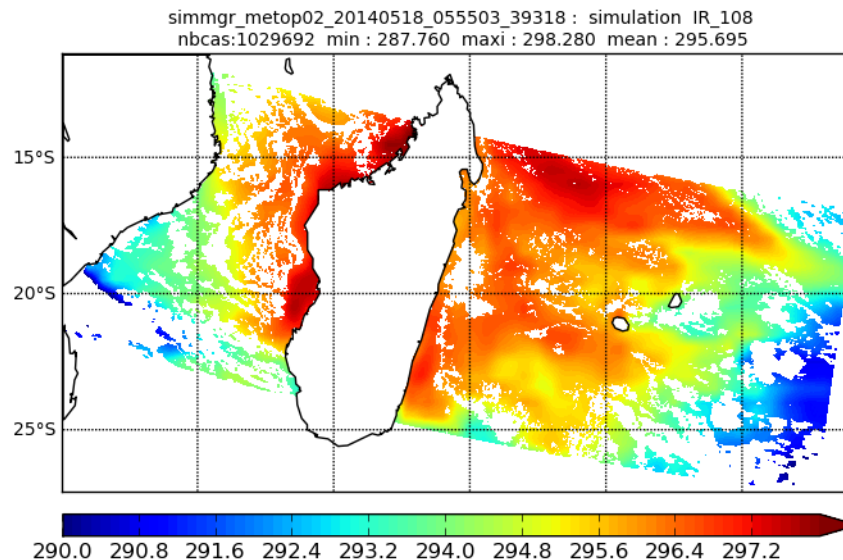
OSI SAF team

Centre de Météorologie Spatiale, Météo-France, Lannion, France



New developments

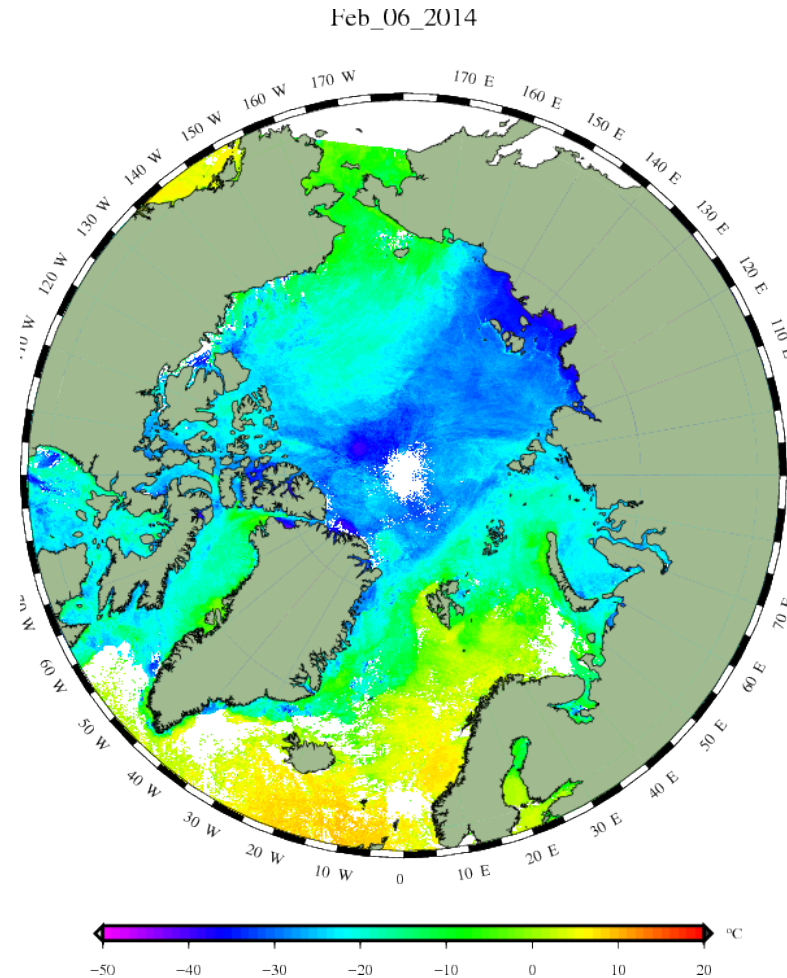
- Lake validation (see Steinar's talk)
- Arctic studies (see Exeter EathTemp meeting report)
- New LEO (METOP/NPP) chain in preoperational mode (see Pierre's talk)



- Reprocessing of MSG archive (end of 2015)
- METOP-A to METOP-B + new chain (end of 2014)
- Introduction of Ice Surface Temperature in High Latitude SST product (end 2014), including Arctic field work for validation by DMI and MET Norway
- Replacement (in July 2014) of
 - Pierre.LeBorgne@meteo.fr
 - by
 - Stephane.SauxPicart@meteo.fr

Ice Surface Temperature

- Based on METOP AVHRR data
- Currently running operationally at DMI for MyOcean
- Will be transferred to OSI SAF in end of 2014
- Image show combined SST and IST averaged over 3 days



EUMETSAT and the Sentinels

EUMETSAT Direct Programmatic Engagement :

EUMETSAT User Community Interest/Link:

Sentinel-1

-

Marine Meteorology, Sea Ice

Sentinel-2

-

EUMETSAT Land SAF

Sentinel-3

**Sentinel-3 Marine Mission
(Marine Centre)**

**Oceanography, Sea Ice
(Seasonal Forecasting,
Climate, Marine Environment)
Marine Meteorology**

Sentinel-4

Part of EUMETSAT MTG System

Atmospheric Composition (GEO)

Sentinel-5

Part of EUMETSAT EPS-SG systems

Atmospheric Composition (LEO)

Sentinel-6

**Jason Continuity of Services
EUMETSAT Optional Program
with Partners (follow-on Jason-2/3)**

Oceanography, Climate

EUMETSAT Sentinel-3 activities



- Collaboration with ESA for European Commission's Copernicus programme
- Operator of the Sentinel-3 Marine Mission (S3A and S3B simultaneously): E2
- Provider of Sentinel-3 marine level-2 data

- Current: Contributing to the development of the Sentinel-3 satellite system and Sentinel-3 ground segment facilities with ESA; Upgrading some of the EUMETSAT multi-mission facilities; Supporting the integration, verification and validation of the full Sentinel-3 ground segment; Supporting operations preparation

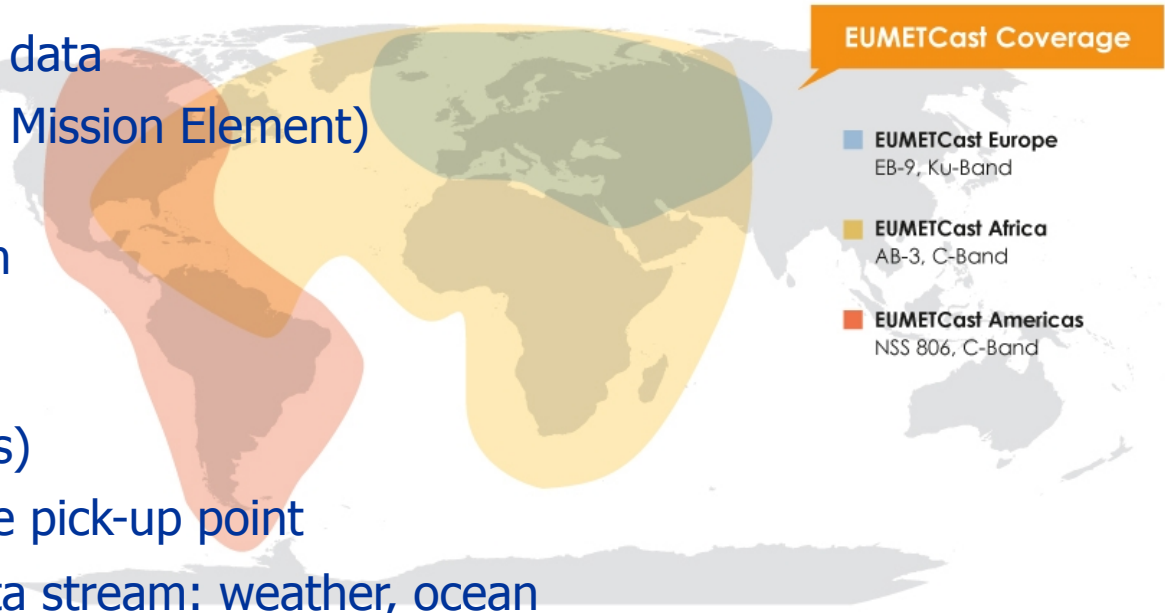
- Near future: Maintenance and evolutions to respond to the Ground Segment functions and services in scope. Support to the development, launch and LEOP of the recurrent mission. Support to the establishment of user requirements, service specifications, and service data requirements.

- Sentinel-3A launch window scheduled between Jul-Aug 15



EUMETSAT Sentinel-3 data dissemination: baseline

- ⤴ On-line data access (ODA)
 - Rolling archive: last 1 month of data
- ⤴ Near Real Time: EUMETCast (Multi Mission Element)
 - Digital Video Broadcast using commercial telecommunication satellite services
 - low cost, standard VSAT (Very Small Aperture Terminals)
 - 3 hour NRT for Sentinel-3 at the pick-up point
 - access to integrated marine data stream: weather, ocean
- ⤴ Long-term archive (Multi Mission Element) (data centre)
 - U-MARF (Unified Meteorological Archive and Retrieval Facility)
 - two last baselines of all products
 - Sentinel-3 SLSTR: Level 1b (NRT, full resolution) available from ODA, data centre; Level 2 (NRT, full resolution) from ODA, data centre and EUMETCast.



EUMETSAT Product Navigator

Central service for all EUMETSAT data and products

<http://www.eumetsat.int/Home/Main/DataProducts/ProductNavigator/>

Data search and data ordering

- Product Dissemination Units over regions of interest
- product subsets containing user-selected parameters

Distribution from the long term archive, U-MARF

Subscription to EUMETCast dissemination services

The screenshot shows the EUMETSAT Product Navigator search interface. The header includes the EUMETSAT logo and the text 'PRODUCT NAVIGATOR Collection Discovery Service'. A navigation menu on the left lists options like 'Simple search', 'Extended search', 'Browse by theme', 'Settings', 'Help', 'Feedback', and 'Reset'. The main search area is titled 'How do you want to search?' and contains several dropdown menus: 'Collection Type' (Database, Document, Software), 'Societal Benefit Area' (Ecosystems, Energy, Health, Water), 'Category' (Software, Temperature, Vegetation, Wave), 'Product Provider' (EUMETSAT), 'Dissemination' (EUMETCast), 'Product Status' (Operational), 'Satellite' (MSG), and 'Instrument' (SEVIRI). Below these are input fields for 'Collection Reference', 'Collection Name', 'Description', and 'Acronym'. There are also fields for 'Time Range' (from and to) and 'Spatial Extent' (North, West, East, South Coordinates). At the bottom, there are checkboxes for 'Access Constraint' (open Access, Show EUMETSAT Data only) and a 'Start query' button with a 'Number of records: 2' indicator.



helpdesk
ops@eumetsat.int



Sentinel-3 Validation Team

ESA-EUMETSAT joint call for Sentinel-3 Validation Team (S3VT)

- “to engage world-class validation expertise and activities to complement Sentinel-3 routine validation and ensure the best possible outcomes for the Sentinel-3 Mission”
- rolling call, continuously open
- no funds from EUMETSAT or ESA
- 80 teams from Europe and around the globe
- need for Fiducial Reference Measurements



S3VT meeting, 26-29 November 2013

- to consolidate and document S3VT activities prior to launch
- to facilitate Phase E1 and Phase E2 Cal/Val planning
- excellent participation, next meeting Autumn 2014 or early 2015 (ESRIN or EUMETSAT)

S3VT Implementation Plan

- reference for the teams and the agencies in support of Cal/Val planning for Phases E1 and E2
- list of proposed S3VT validation activities
- data and support needs and recommendations from the teams

EUMETSAT validation activities for SST include:

- ✦ Routine monitoring and quality control
- ✦ OSI-SAF SLSTR-A SST MDB with drifting buoys, moored buoys, ships, and ability to compare with SST products from other sensors
 - OSI-SAF and EUM central facilities joint activity
- ✦ SLSTR-IASI level 1 inter-comparisons (GSICS), including preparation with AVHRR inter-comparisons
- ✦ Close interactions with Mission Performance Centre and Expert Support Laboratories.
- ✦ Collaboration with Mission Performance Monitoring Facility



Baseline Surface Temperature Products (SLSTR)

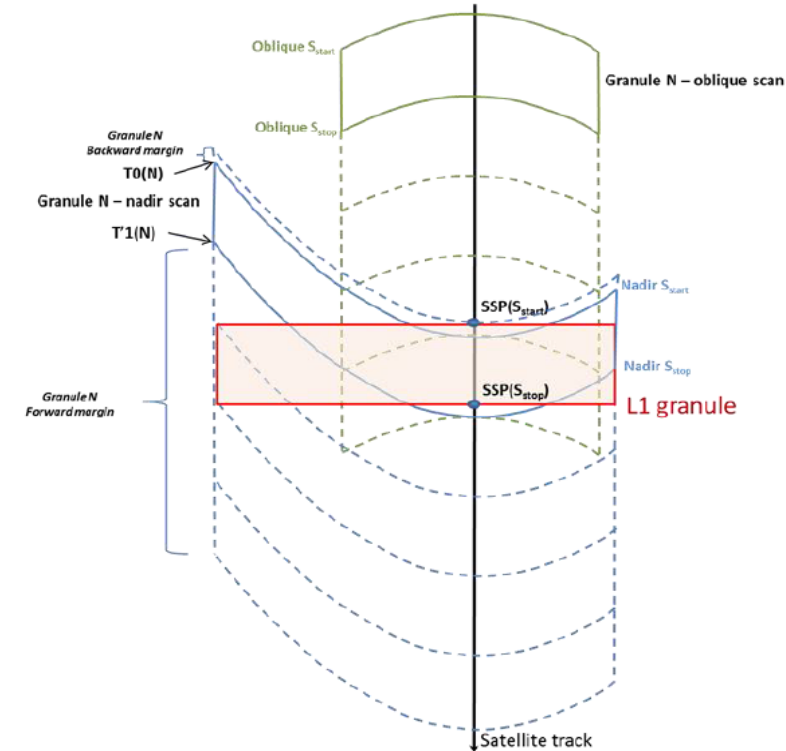
Product (ID)	Parameter	Parameter Definition
SLSTR Level 1B (SLSTR-L1B) [SL_1_RBT]	Top of Atmosphere radiances Top of Atmosphere brightness temperatures	Radiance in [W m² sr⁻¹ μm⁻¹] of band S1-S3. Brightness Temperatures for S4-S9 in [K]. All values in dual view with time stamps, flags, geo-location and meteo annotation data set
Level 2 SST (SLSTR-SST) [SL_2_WST]	Sea Surface skin Temperature (SST)	Stand-alone product conforming to the GHRSSST L2P specification, containing a composite "best SST" field, error estimates and contextual auxiliary data fields, SST in [K] and various other units. Note: intermediate SST estimates (D2/D3/N2/N3 SSTskin products) are produced but not distributed
Level 2 LST (SLSTR-LST) [SL_2_LST]	Land Surface Temperature (LST) -> ESA	Single view, two channel land surface temperature in [K], associated error estimates, exception flags, and contextual information Ancillary data: NDVI, GlobCover classification, Fractional vegetation cover



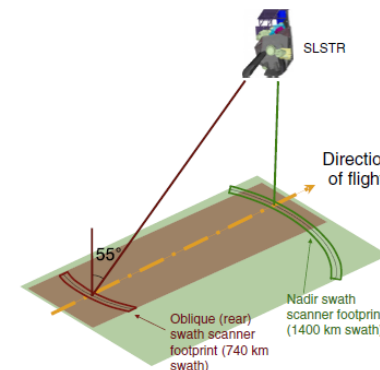
SLSTR Sea Surface Temperature: Level-1b

Level 1b (ESA and EUMETSAT)

- Nine channels + 2 fire from visible to IR (radiance and BTs).
- Re-gridding of curved scans to image grid with SSP as reference for nadir and oblique views (scans->lines).
- Product contains cosmetically filled pixels. Retains all orphan pixel information indexed by line.
- Tools to be provided to convert from line to scan (equivalent to level-1a). All information is stored.



Any user feedback on image or instrument grid?



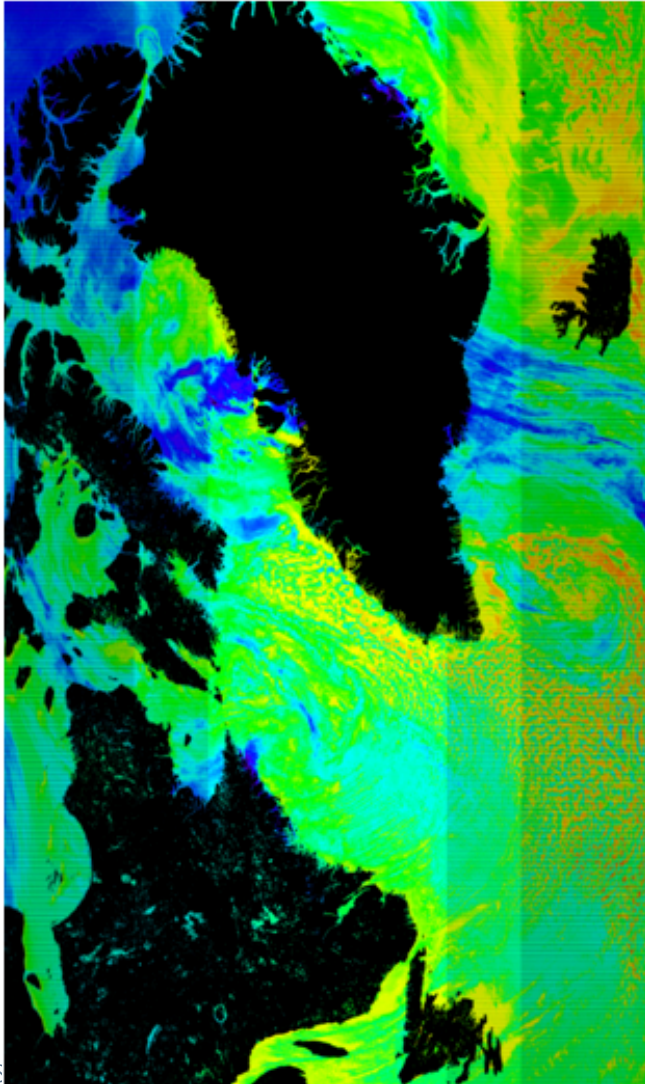
SLSTR Sea Surface Temperature: Level-2

Level 2 (distributed by EUMETSAT only)

- Five single SST algorithms (view/time of day/aerosol) derived from weighted combinations of BTs measured in both views (nadir and oblique) by the thermal channels.
- Weights are functions of viewing geometry and WV loading.
- Future evolutions planned on cloud detection from threshold to Bayesian cloud scheme (by launch or end of commissioning)
- Lake Surface Water Temperature to be provided in the L2P (initially using SST retrieval)

-> Sentinel-3 SLSTR products guides and ATBD's available from <https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-slstr>

3rd party data – NOAA Suomi NPP products for Copernicus



- SNPP4C project building on the established EUMETSAT/NOAA relationship
- Uses existing infrastructure to deliver S-NPP products to European Copernicus programme
- SST from VIIRS (ACSPO 2.3) -> MyOcean2
- Atmospheric composition from VIIRS, OMPS and CrIS -> MACC-II
- 8th May: first dissemination of SST
 - First processed at EUMETSAT to reduce their volume by 50% before redistribution by EUMETCast

3rd party SST data – JAXA, ISRO and NSOAS/SOA

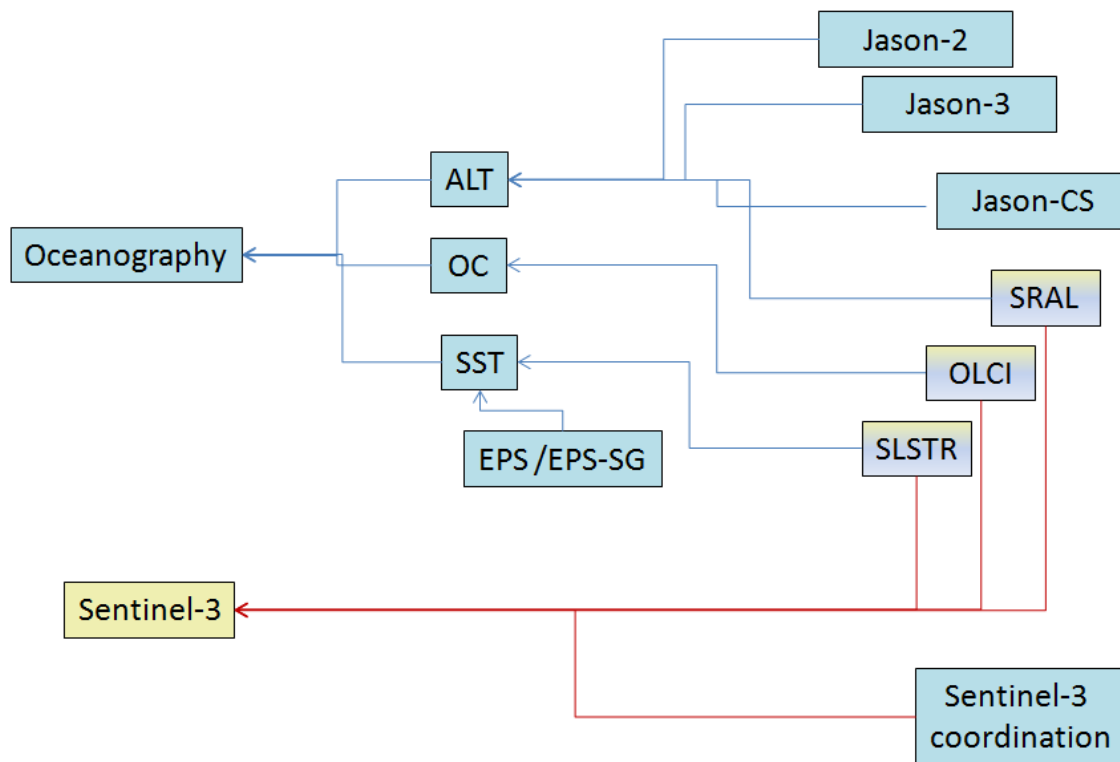
In addition to its own satellite data and meteorological products, EUMETSAT also distributes data and products from partner organisation as part of an international cooperation, some of which is made available via EUMETCast, direct dissemination and the internet.

Relevant to SST, include:

- NSOAS/SOA/EUMETSAT bi-lateral in 2013 at EUMETSAT
 - EUMETSAT receive microwave SST data from HY-2a from NSOAS.
- AMSR-2 from JAXA to EUM member states via EUMETCast. Process of receiving and re-distributing GHRSSST AMSR-2 has started ~end of 2014.
- Sample SST data (HDF) from Insat-3D from ISRO and contacts established.

EUMETSAT – Marine Applications

Includes Marine Meteorology & Oceanography



Oceanography:
Hans Bonekamp
Ewa Kwiatkowska (OC)
Anne O'Carroll (SST)
Remko Scharroo (ALT)

From Sept 14:
Igor Tomažić



- ✦ EUMETSAT Meteorological Satellite Conference, Geneva, Switzerland, 22-26 September 2014
 - <http://www.eumetsat.int/website/home/News/ConferencesandEvents/index.html>
 - Sessions include “Marine meteorology and oceanography”, “Instrument calibration and validation campaigns”...

- ✦ Climate Symposium 2014, Darmstadt, Germany, 13-17 October 2014
 - http://www.theclimatesymposium2014.com/index_.php/climatesymposium/index