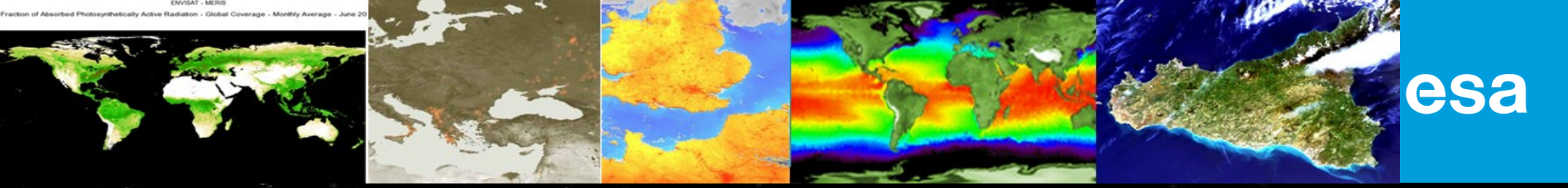


# SENTINEL-3

Ph. Goryl – ESA/ESRIN

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# OUTLINE

- SENTINEL-3 Mission
- OLCI and SLSTR
- The products
- The Cal/Val Plan
- Conclusion

# SENTINEL-3 MISSION


The Sentinel-3 Mission, being part of Copernicus Space Component, is an operational mission in high-inclination, low earth orbit

Full performance achieved with 2 satellites in orbit (S-3A,-3B)

Sentinel-3 implements 3 core missions to deliver continuity to

**Sea and land color data**, through **OLCI (Ocean and Land Color Instrument)** at least at the level of quality of the Medium Resolution Imaging Spectrometer (MERIS) instrument

**Sea and land surface temperature**, through the **SLSTR (Sea and Land Surface Temperature Radiometer)** at least at the level of quality of the Advanced Along-Track Scanning Radiometer (AATSR) instrument

**Sea surface topography data**, through a Topo P/L including a **Ku-/C-band Synthetic Aperture Radar Altimeter (SRAL)** and a bi-frequency **MicroWave Radiometer (MWR),** at least at the level of quality of the Envisat Radar Altimeter (RA) system

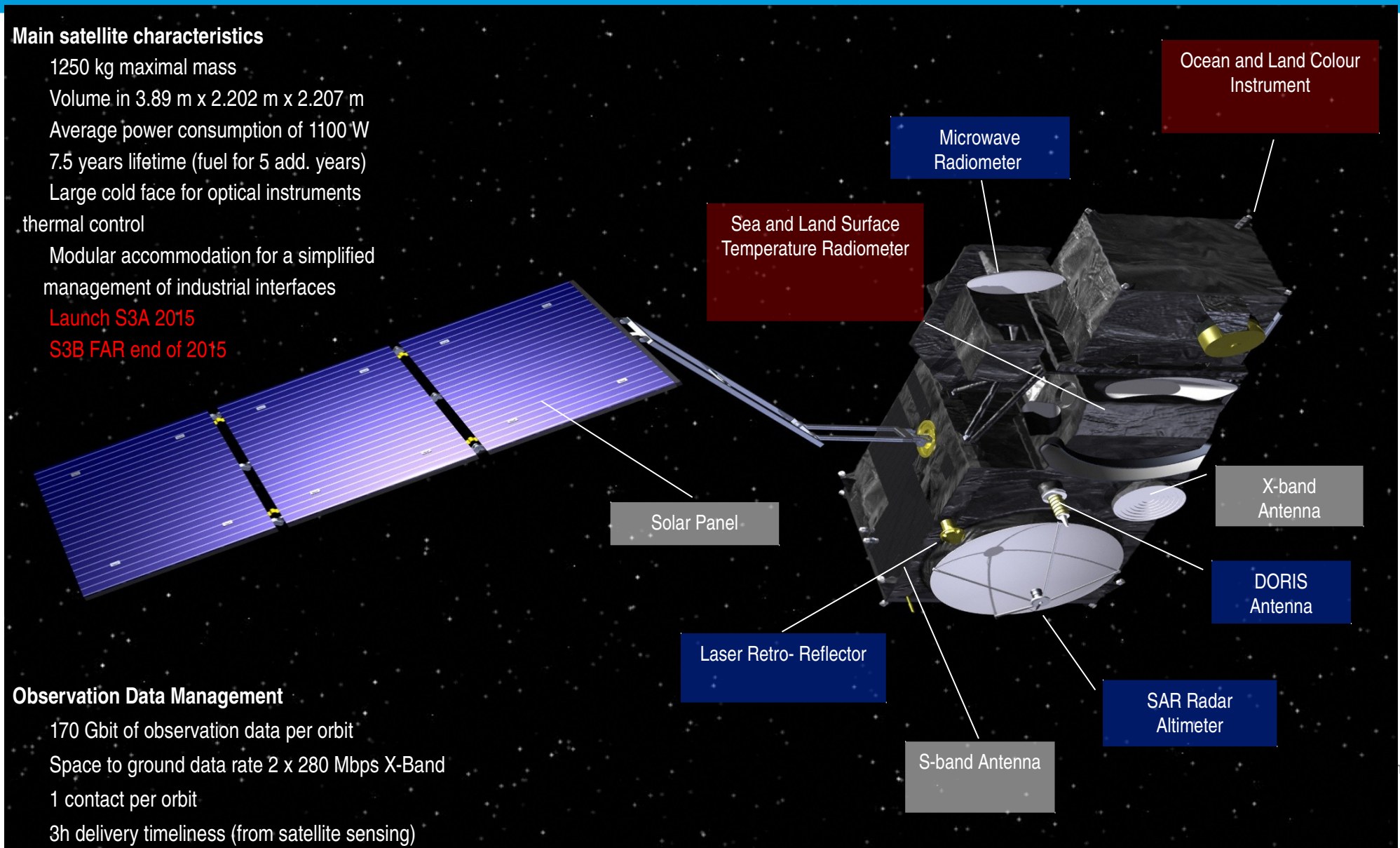
In addition, the payload design will allow

- Data continuity of the Vegetation instrument (on SPOT4/5),
- Enhanced fire monitoring capabilities,
- Along-track SAR for coastal zones, in-land water and sea-ice topography

# The Satellite

**Main satellite characteristics**

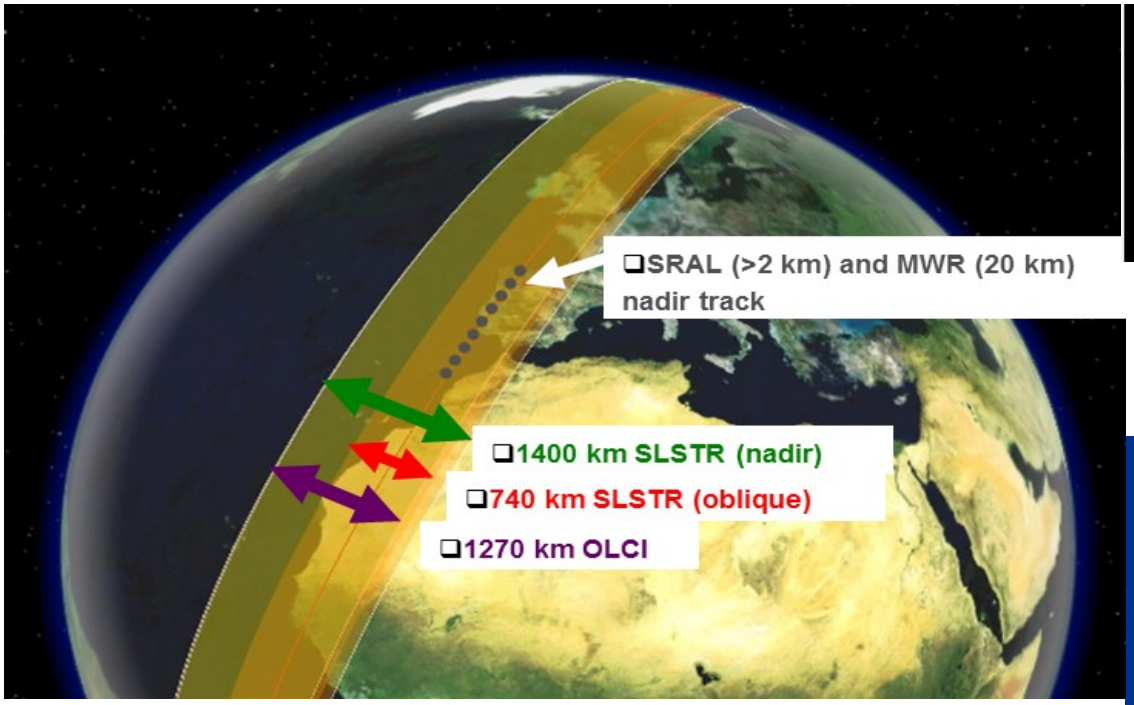
- 1250 kg maximal mass
- Volume in 3.89 m x 2.202 m x 2.207 m
- Average power consumption of 1100 W
- 7.5 years lifetime (fuel for 5 add. years)
- Large cold face for optical instruments thermal control
- Modular accommodation for a simplified management of industrial interfaces
- Launch S3A 2015
- S3B FAR end of 2015




**Observation Data Management**

- 170 Gbit of observation data per orbit
- Space to ground data rate 2 x 280 Mbps X-Band
- 1 contact per orbit
- 3h delivery timeliness (from satellite sensing)

# Repeat Cycle – revisit capability




| | |
|---|---|
| Orbit type | ❑ Repeating frozen SSO |
| Repeat cycle | ❑ 27 days (14 + 7/27 orbits/day) |
| LTDN | ❑ 10:00 hr |
| Average altitude | ❑ 815 km |
| Inclination | ❑ 98.65 deg |

| | | Revisit at Equator | Revisit for latitude > 30° | Spec. |
|---|---|---|---|---|
| Ocean Colour (Sun-glint free, day only) | 1 Satellite | < 3.8 days | < 2.8 days | |
| | 2 Satellites | < 1.9 days | < 1.4 days | < 2 days |
| Land Colour (day only) | 1 Satellite | < 2.2 days | < 1.8 days | |
| | 2 Satellites | < 1.1 day | < 0.9 day | < 2 days |
| SLSTR dual view (day and night) | 1 Satellite | < 1.9 days | < 1.5 days | |
| | 2 Satellites | < 0.9 day | < 0.8 day | < 4 days |

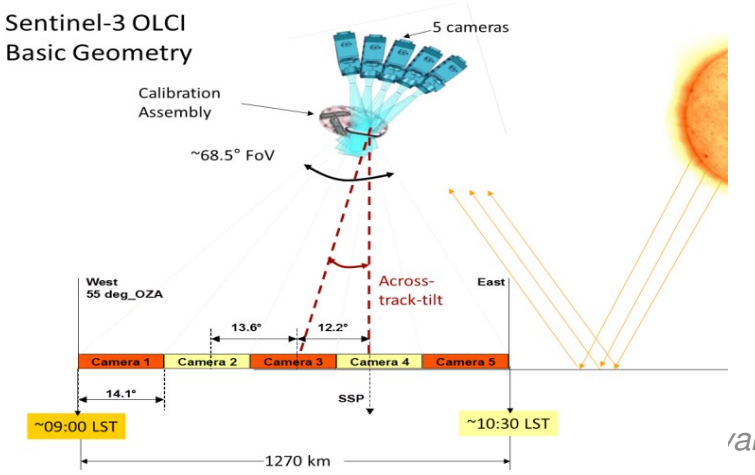
**Optical missions**:
Short Revisit times for optical payload, even with 1 single satellite

# OCLI

## Pushbroom Imaging Spectrometer (VIS-NIR) – similar to MERIS

**Key Improvements/Features:**

- More spectral bands (from 15 to 21): 400-1020 nm
- Broader swath: 1270 km
- Reduced sun glint by camera tilt in west direction (12.20°)
- Absolute (relative) accuracy of 2% ( relative 0.5%)
- Polarisation sensitivity < 1%
- Full res. 300m acquired systematically for land & ocean
- Reduced res. 1200m binned on ground (L1b)
- Improved characterization, e.g. straylight, camera boundary characterization
- Ocean coverage < 4 days, (< 2 days, 2 satellites)
- Timeliness: 3 hours NRT Level 2 product
- 100% overlap with SLSTR



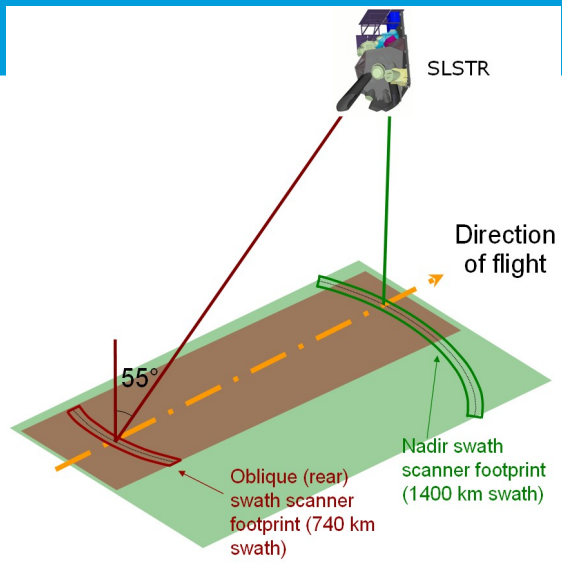

| MERIS Bands | λ center | Width |
|---|---|---|
| Yellow substanace/detrital pigments | 412.5 | 10 |
| Chl.. Abs. Max | 442.5 | 10 |
| Chl & other pigments | 490 | 10 |
| Susp. Sediments, red tide | 510 | 10 |
| Chl. Abs. Min | 560 | 10 |
| Suspended sediment | 620 | 10 |
| Chl. Abs, Chl. fluorescence | 665 | 10 |
| Chl. fluorescence peak | 681.25 | 7.5 |
| Chl. fluorescence ref., Atm. Corr. | 708.75 | 10 |
| Vegetation, clouds | 753.75 | 7.5 |
| O2 R-branch abs. | 761.25 | 2.5 |
| O2 P-branch abs. | 778.75 | 15 |
| Atm corr | 865 | 20 |
| Vegetation, H2O vap. Ref. | 885 | 10 |
| H2O vap., Land | 900 | 10 |

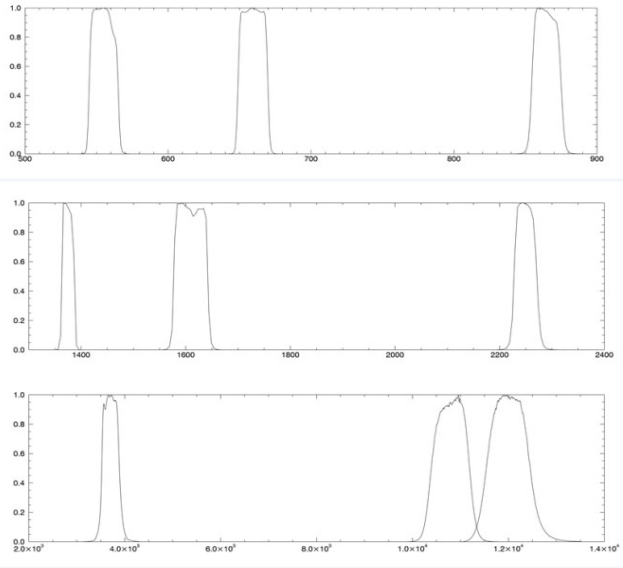
| New OLCI bands | λ center | Width |
|---|---|---|
| Aerosol, in-water property | 400 | 15 |
| Fluorescence retrieval | 673.75 | 7.5 |
| Atmospheric parameter | 764.375 | 3.75 |
| Cloud top pressure | 767.5 | 2.5 |
| Atmos./aerosol correction | 940 | 20 |
| Atmos./aerosol correction | 1020 | 40 |

# SLSTR

- **To enable a wider swath** SLSTR uses **two** scan systems (nadir and oblique) and optical paths
- A **flip mirror** (new) is used to select which optical path is directed to the detectors
- The **nadir swath has a westerly offset** to completely overlap the OLCI swath
- One VIS channel (865nm) is used for **co-registration with OLCI** swath
- The **oblique view 55°inclination** maintains a **longer atmospheric path length** compared to nadir
  - **better atmospheric correction**
- **Both scan chains view the same blackbody and VISCAL targets**

| | | ATSR-1 | ATSR-2 | AATSR | SLSTR |
|---|---|---|---|---|---|
| | | ERS-1 | ERS-2 | ENVISAT | Sentinel3 |
| Swath [km] | Nadir | 500 | 500 | 500 | 1400 |
| | oblique | 500 | 500 | 500 | 740 |
| SSI [km] VIS/SWIR | Resolution at sub sat point | 1 | 1 | 1 | 0.5 |
| SSI [km] IR | | 1 | 1 | 1 | 1 |
| Band 1[12] | Chlorophyll | - | 0.555 | 0.555 | 0.555 |
| Band 2 | Veg. Index | - | 0.659 | 0.659 | 0.659 |
| Band 3 | Veg. Index | - | 0.865 | 0.865 | 0.865 |
| Band 4 | Cloud clearing | - | - | - | 1.375 |
| Band 5 | Cloud clearing | 1.610 | 1.610 | 1.610 | 1.610 |
| Band 6 | Cloud clearing | - | - | - | 2.250 |
| Band 7 | SST | 3.740 | 3.740 | 3.740 | 3.740 |
| Band 7 F | Fire | - | - | - | 3.740 |
| Band 8 | SST | 10.850 | 10.850 | 10.850 | 10.850 |
| Band 8 F | Fire | - | - | - | 10.850 |
| Band 9 | SST | 12.000 | 12.000 | 12.000 | 12.000 |
| Life time [years] | As designed | 3 | 3 | 5 | 7.5 |
| | As flown | 1991-2000 | 1995-2008 | 2002-2012 | |



# The Core Products

## The Core Ground Segment:

**CSC Core Ground Segment:** (CSC- Copernicus Space Component - funded), providing primary data access to Sentinel Missions and coordinating access functions to Contributing Missions data

→ Focus on systematic core product generation L0, L1 and L2
→ Provide online data distribution for Sentinels and data from Contributing Missions
→ Apply the Sentinel Data Policy (free of charge)

**Sentinels' Collaborative Ground Segment:** (non CSC-funded) provides a frame for specialised solutions to further enhance the Sentinels missions exploitation/ data access in the areas of:

1. Sentinels data acquisition (in addition to core GS) and (quasi-) Real Time production
2. Complementary collaborative data products and algorithms definition
3. GSC data product dissemination and access (e.g. mirror sites)
4. Development of innovative tool

## ESA and EUMETSAT sharing operations:

→ ESA will operate the Land Core Ground Segment – generation and distribution of Land products
→ EUMETSAT will operate the Marine Core Ground Segment – generation and distribution of Marine products
→ The L1B will be common – generation and distribution from both ESA and EUMETSAT

# The Core Products

**Sentinel-3 Production is about 3.4 Tbyte per day (higher values)**

**→ about 243 GB every 100 minutes (i.e. every orbit).**

**Level 1 ESA/EUMETSAT**

**LEVEL 1**
- OLCI L1B
- SLSTR L1B

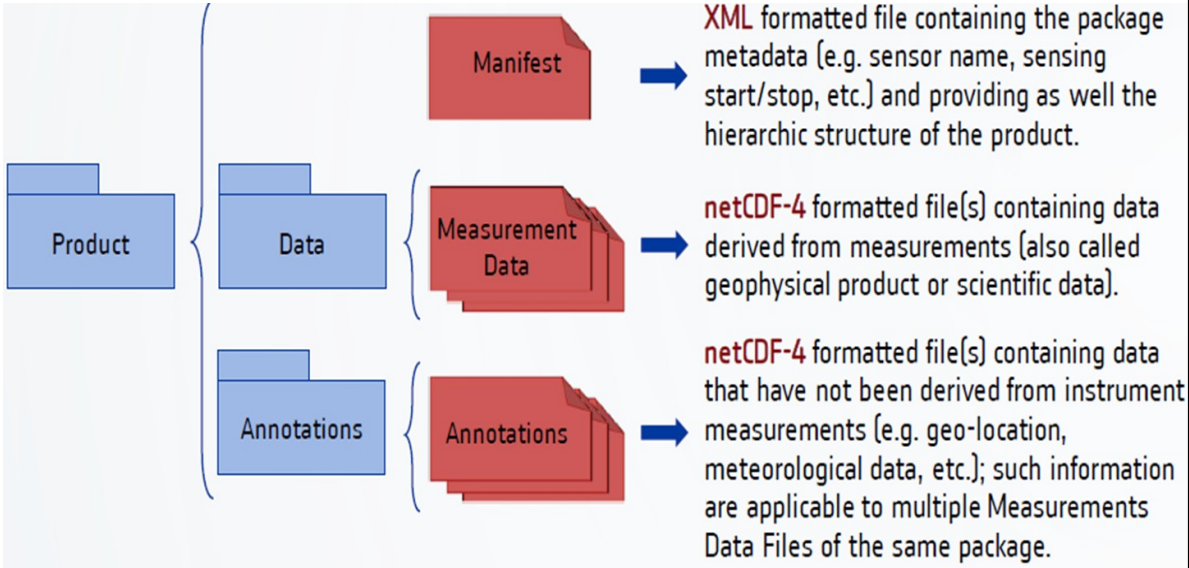
**Marine products EUMETSAT**

**LEVEL 2**
- OLCI ocean color
- SLSTR sea
- SRAL L2

**Land products ESA**

**LEVEL 2**
- OLCI Land
- SLSTR Land
- SYNERGY / VGT
- SRAL L2

The Sentinel-3 products are organized in packages, following a **XFDU specialization*** (**SENTINEL SAFE** format). A Product Package is a physical collection of files grouped under a single directory, using a defined packaging scheme



# vel 1 products

## OLCI

| Product Type | Timeliness | Level | Description | Size (GB/orbit) | Size frame / mn | |
|---|---|---|---|---|---|---|
| OL_1_EFR___ | NRT/NTC | 1B | Full Resolution top of atmosphere radiance - orthogeolocated | **27.9** | 0.634 | 1 |
| | | | | | 1.268 | 2 |
| | | | | | 1.9 | 3 |
| | | | | | 3.17 | 5 |
| OL_1_ERR___ | NRT/NTC | 1B | Reduced Resolution top of atmosphere radiances - orthogeolocated | **1.70** | 0.0386 | 1 |
| | | | | | 0.0772 | 2 |
| | | | | | 0.116 | 3 |

## SLSTR

| Product Type | Timeliness | Level | Description | Size (GByte/orbit) |
|---|---|---|---|---|
| SL_1_RBT___ | NRT/NTC | 1B | Brightness temperatures and radiances top of atmosphere radiance - orthogeolocated | **45.60** |

# el 2 products

## OLCI

| Product Type | Timeliness | Level | Description | Size (GB/orbit) |
|---|---|---|---|---|
| OL_2_LFR (300 m res)<br><br>OL_2_LRR (1 km res) | NRT/NTC | 2 | OGVI = FAPAR (algorithm developed by Nadine Gobron – JRC) + rectified channels at 681nm and 865 nm<br><br>OCTI = Chlorophyll Index ((algorithm developed by Jadunandan Dash – JRC) | **7.32 for FR**<br><br>**0.50 for RR** |

## SLSTR

| Product Type | Timeliness | Level | Description | Size (GB/orbit) |
|---|---|---|---|---|
| SL_2_LST (1 km res) | NRT/NTC | 2 | Land Surface Temperature (algorithm developed by Univeristy of Leceister and NILU (F.Prata)) including NDVI and Biome map. | **2.46** |

# el 2 products

## SYNERGY

| Product Type | Timeliness | Level | Description | Size (GB/orbit) |
|---|---|---|---|---|
| SY_2_SYN___ (300 m) | NTC | 2 | Surface Reflectances and Aerosol measurements over Land – algorithm developed by Peter North – Univ. Of Swansea. | **30** |
| SY_2_VGP___ (1km) | NTC | 2 | 1 km VEGETATION Like product (~VGT-P) - TOA Reflectances | **1.24** |
| SY_2_VG1___ (1 km) | NTC | 2 | 1 km VEGETATION Like product (~VGT-S1) 1day synthesis surface reflectances and NDVI | **8.8** |
| SY_2_V10___ (1 km) | NTC | 2 | 1 km VEGETATION Like product (~VGT-S10) 10days synthesis surface reflectances and NDVI | **8.8** |

**Information (ATBD, Product Specification) on mission and products can be found at: http://Sentinel.esa.int**

# “New” products under development

**Request from EC for two “new” operational products**

a. **Fire Radiative Power**
b. FRP in core product list
c. FRP at 1 km (pixel level)
d. Accuracy: goal 10%, threshold 30%
e. Threshold Detection: Goal 5MW, threshold 50 MW
f. NRT (< 3 h)

g. **Aerosol (Global)**
h. Global Aerosol in core product list
i. Aerosol at pixel level (goal)
j. Accuracy: goal AOD 0.1 over land, AOD 0.05 over ocean
k. NRT (< 3 h)
l. AOD 550 nm over ocean and land (goal)
m. Include uncertainties at pixel level (goal)

1. Prototyping start from existing basis (M.Wooster, P.North)
2. Improvement needed
3. Implementation and testing

# Cal/Val program

- To meet the baseline product quality requirements, Calibration and Validation (Cal/Val) activities will be routinely performed during the Operational Phase.

- This includes:
  - Level-1B Calibration and Validation
  - Level-2 Validation

- Performed by:
  - MPC (Mission Performance Centre) and Eumetsat, ESA experts
  - Expert Cal/Val Teams

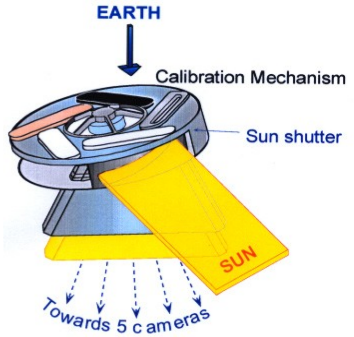
- CEOS framework, QA4EO guidelines

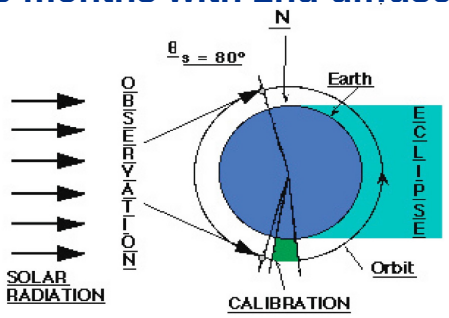
- Strong heritage from ENVISAT

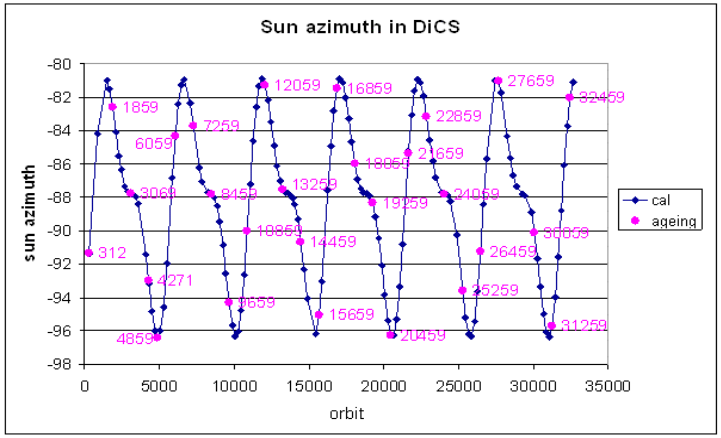
- Phase E2 Cal/Val plan.

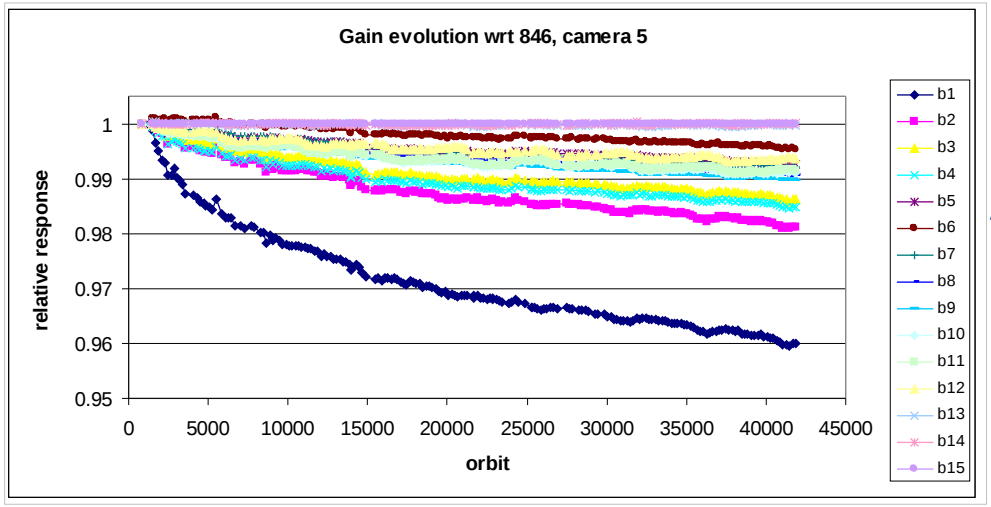
# OLCI : Level 1 radiometric calibration

**Like MERIS, OLCI performs on board radiometric calibration :**
**Every 2 weeks routine with 1st diffuser**
**Every 3 months with 2nd diffuser for ageing**




*Maximum degradation of 4 %*
*after more than 8 years in space*

*Space environment implies **ageing** of Diffuser and Optics*
*2nd diffuser to monitor diffuser-1 BRDF ageing*
*=> Diffuser Aging model*
*frequent calibration to monitor Instrument degradation*
*=> instrument degradation model*

$$G(t) = G(t_0) \cdot \left(1 - \beta \cdot \left(1 - \gamma \cdot e^{-\delta t}\right)\right)$$

*Degradation Model based*
*on the SeaWifs model (Barnes et al.)*

# Level 1 radiometric vicarious verification

*We have gained confidence in the absolute accuracy of the MERIS L1b radiometric calibration*
*But Radiometric vicarious calibration is used to verify that:*

1. *the absolute radiometric level of L1b data is within the error bars of the methodologies.*
2. *no temporal trend is detected with these methodologies*

*Methodologies:*
*Rayleigh, Glint, Desert, Snow, Dark target*

*Instrumented site:*
*Campaign, Radcalnet (prev. LANDNET)*

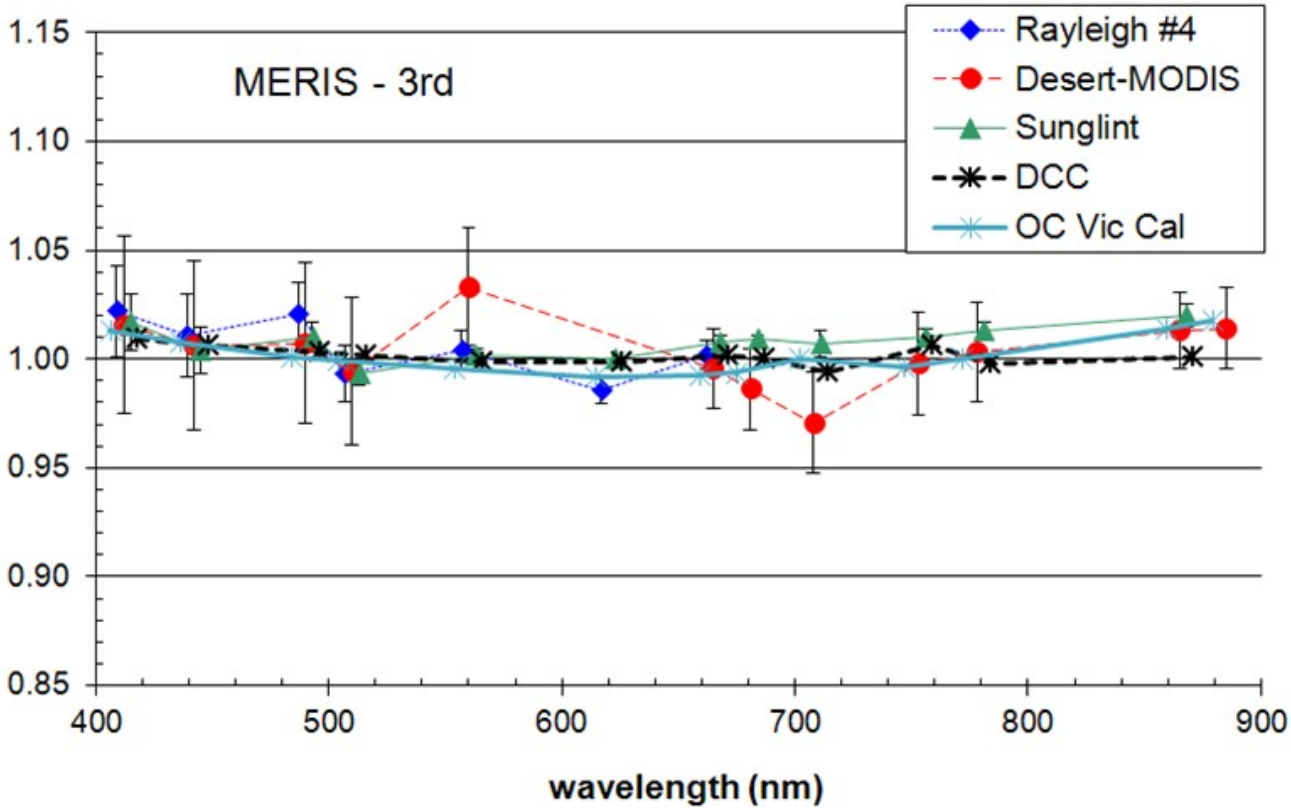
*CEOS/IVOS framework*

*CNES : SADE*
*Rayleigh, Glint, Desert*

*Dave Smith RAL*
*Desert and snow*

*DIMITRI: M.Bouvet ESTEC*
*Intercomparison*

*Dark target: Richard Santer, LISE*

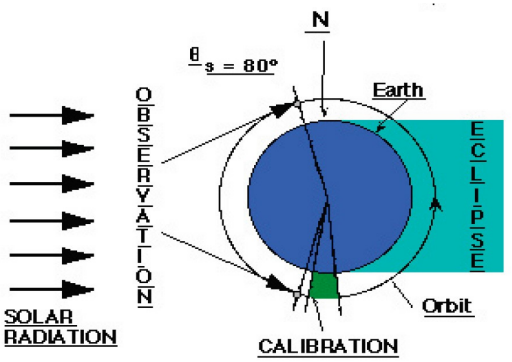


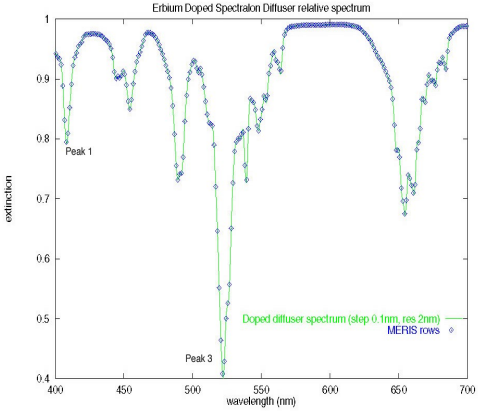
# Spectral calibration: Erbium, Fraunhofer and O2 Lines

**Erbium Doped Diffuser**

On board calibration

Every 6 months



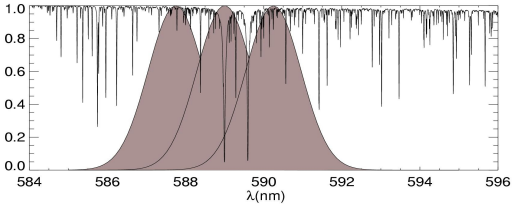



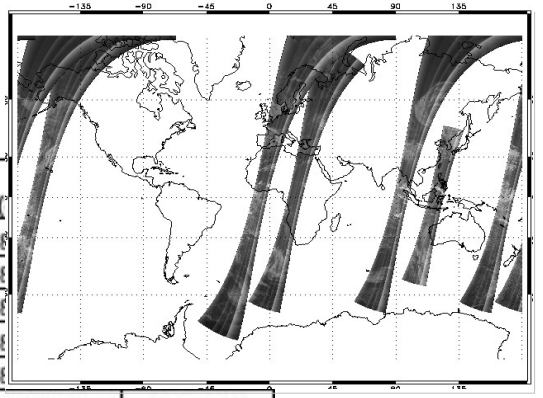

**Complemented by:**

Fraunhofer absorption

O2 absorption

Every year (TBC)

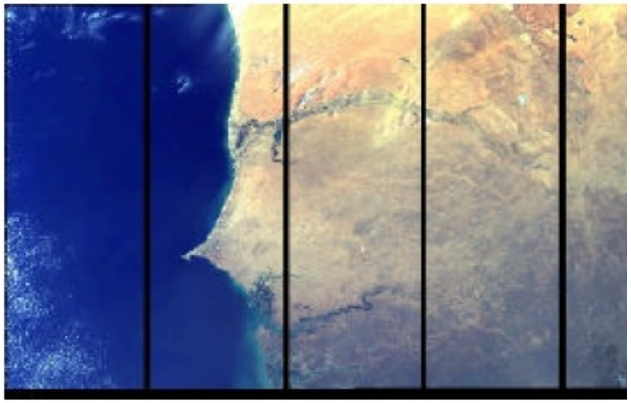


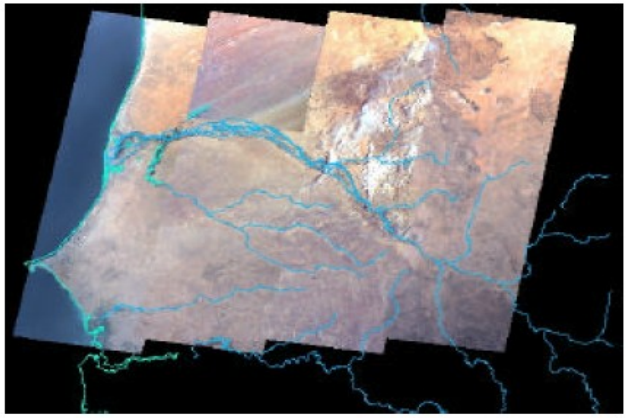



| line 1 (393nm) | line 2 (485nm) | line 3 (588nm) | line 4 (655nm) | | |
|---|---|---|---|---|---|
| 393.125 | 480.625 | 584.375 | 653.125 | | |
| 394.375 | 481.875 | 585.625 | 654.375 | | |
| 395.625 | 483.125 | 586.875 | 655.625 | | |
| 396.875 | 484.375 | 588.125 | 656.875 | | |
| 398.125 | 485.625 | 589.375 | 658.125 | | |
| 399.375 | 486.875 | 590.625 | 659.375 | 856.875 | 869.375 |
| 400.625 | 488.125 | 591.875 | 660.625 | 858.125 | 870.625 |
| | 489.375 | 593.125 | | | |

*Fraunhofer Band settings*

# Geometric calibration and verification





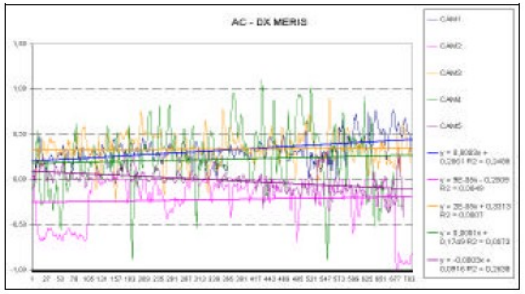
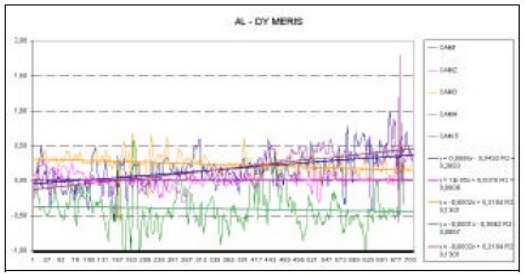



*fig. 10 - FR-FS-O Across Track camera profile*




**Geometric calibration**

Based on reference image

GCP

Disparity analysis

-> Not frequent

**Verification:**

Coast lines

Reference images

-> frequent

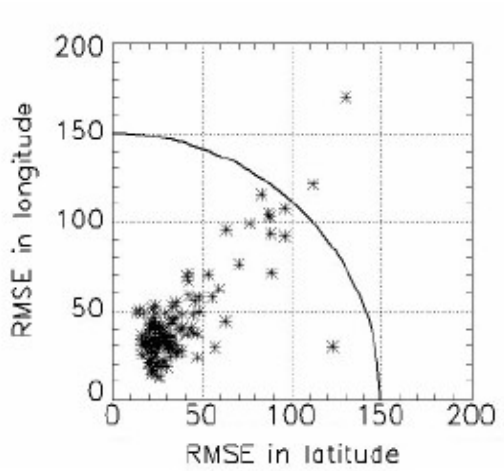
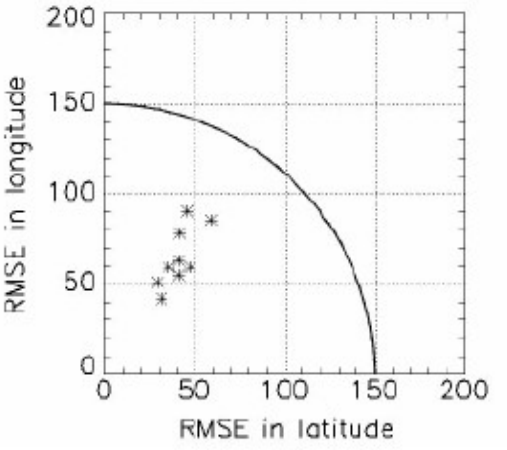



*Figure 2 Relative RMS error (meter)*

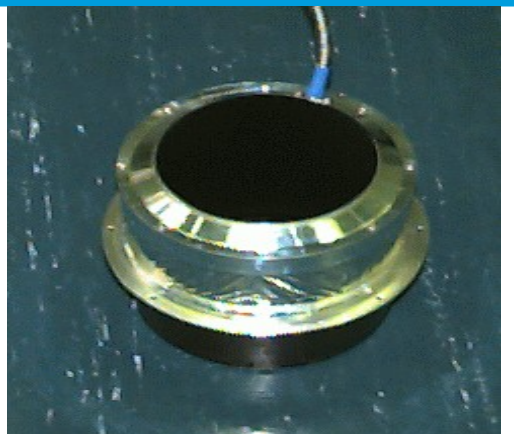


# SLSTR Calibration

**SLSTR is a self-calibrating instrument.**

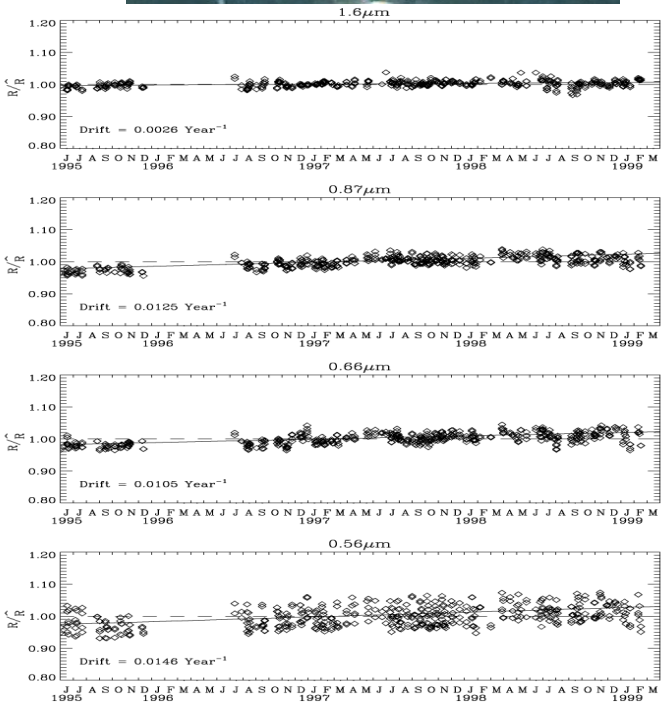
on-board calibration system with:
- Two specially designed and highly stable blackbody
Observed at each scan

- Reflecting target that is illuminated once per orbit (for the VIS-SWIR channels) at the pole.



**Vicarious calibration**

- Stable sites (Desert, snow) used to characterize / correct the drift.



# SLSTR / OLCI radiometric vicarious calibration: CEOS framework

- **Sentinel radiometric vicarious calibration in the CEOS / IVOS context**
  - Use “CEOS agreed fixed sites”
  - Desert
  - Snow
  - Rayleigh
  - Instrumented sites (Landnet)
  - Use “CEOS agreed methodologies”
  - Share the resources / results in the CEOS community
  - Cal/Val portal for communication / exchanges
  - CEOS insitu intercomparison exercise (MIAMI3, Tuzgulu, OC AAOT workshop)

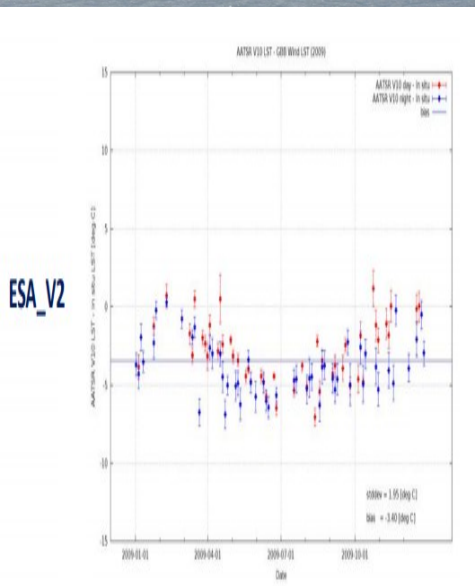
- Vicarious calibration used for monitoring, characterization, uncertainty estimation, correction if needed (SLSTR), comparison with other sensors (GMES, CCI) and potential inter-calibration.

→ need to be an international and coordinated effort (GEOSS)

# Validation

## Generic approach

- Validation against precise Fiducial Reference Measurements (few points but precise)
- Validation against Fiducial Reference Measurements (more points less precise)
- Validation against others sources (satellite comparison)
- Validation against Models (data assimilation rejection statistics, integrated model analyses…)
- Validation using Level 3 data: Statistical comparison between various L-3 from various sensors constitutes an extremely useful tool (mean, median, sd, bias, RMS…. for selected zones, transects, latitudinal bands, seasonal trends… ) for a cross-validation of the products
- Validation using monitoring tools (statistic, trend, QC..Etc.)

# SLSTR LST validation

## LST Validation Protocol

**Category A: Comparison of satellite LST with in situ measurements**

This is the traditional and most straightforward approach to validating LST. It involves a direct comparison of satellite-derived LST with collocated and simultaneously acquired LST from ground- based radiometers.

**Category B: Radiance-based validation**

This technique uses top-of-atmosphere (TOA) brightness temperatures (BTs) in conjunction with a radiative transfer model to simulate ground LST using data of surface emissivity and a atmospheric profiles of air temperature and water vapour content.

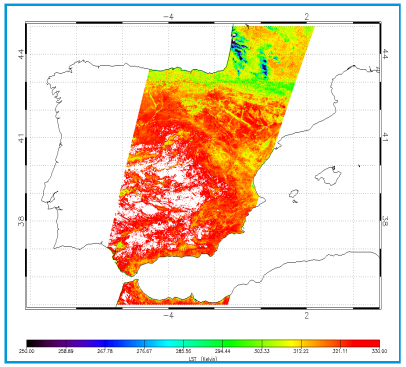
**Category C: Inter-comparison with similar LST products**

A wide variety of airborne and spaceborne instruments collects thermal infrared data and many provide operational LST products. An inter-comparison of LST products from different satellite instruments can be very valuable for determining LST.

**Category D: Time series analysis**

Analysing time series of satellite data over a temporally stable target site allows for the identification of potential calibration drift or other issues of the instrument that manifest themselves over time. Furthermore, problems associated with cloud contamination for example may be identified from artefacts evident in the time series. Care must be taken in distinguishing between instrument-related issues such as calibration drift and real geophysical changes of the target site or the atmosphere.

→ ***See presentation from Darren Ghent – Wednesday 13:00***



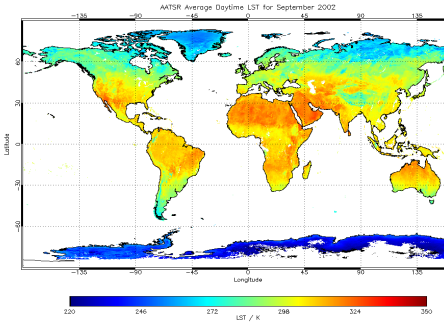

**Specific validation campaigns, and the collection of ground-based measurements.**

Sites under investigation:

LSA-SAF sites: Evora, Portugal; Gobabeb, Namibia; Dahra, Senegal

ARM sites: SGP, Oklahoma, USA; Niamey, Niger.

Others: Valencia, Spain – University of Valencia; Cardington, UK – UK Met Office, Australian sites.

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# Land Synergy products validation

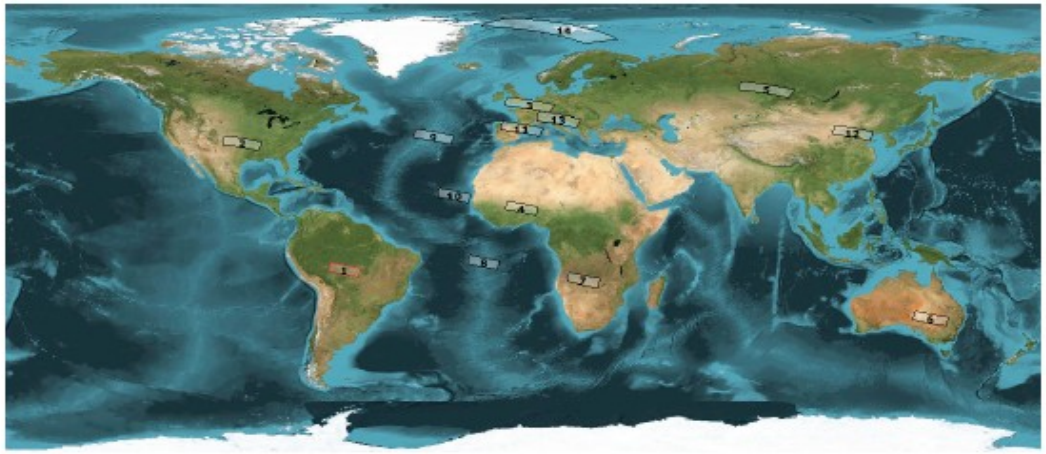
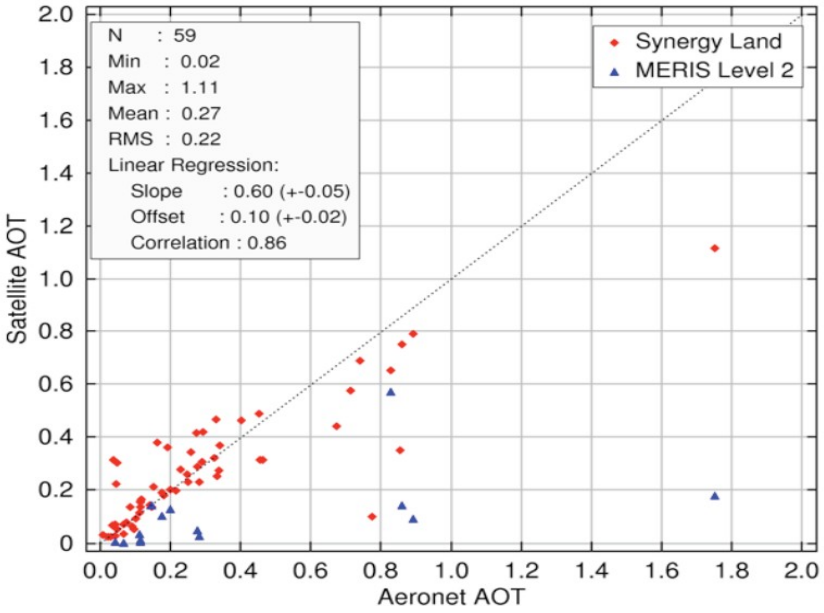


*Figure 5. Location of image sets selected for aerosol retrieval validation.*

- Validation using AERONET
- Ad-Hoc ground based campaign
- Sensor comparison

***Table 7. Test site location and cover type***

| Site name | Lat. | Long | Cover type |
|---|---|---|---|
| Abracos_Hill | -10.8°N | -62.4°E | Forest |
| Beijing | 40.0°N | 116.4°E | Urban |
| Cart_Site | 36.6°N | -97.5°E | Grassland |
| Lille | 50.6°N | 3.1°E | Urban |
| Mongu | -15.3°N | 23.2°E | Semi-arid |
| Ouagadougou | 12.2°N | 1.4°E | Semi-arid |
| Tinga Tingana | -29.0°N | 140.0°E | Semi-arid |
| Tomsk | 56.5°N | 85.1°E | Forest |
| Longyearbyen | 78.2°N | 15.7°E | Ice/snow |
| Ascension Isl. | 8.0°N | -14.4°E | Ocean |
| Azores | 38.6°N | -28.6°E | Ocean |
| Barcelona | 41.39°N | 2.12°E | Coastal |
| Capo_Verde | | | Ocean |
| Venise | 45.31°N | 12.51°E | Coastal |



# Land OGVI validation

**Main Goal:**

Independent strategy for making use of ground-based measurements over a large sample of vegetation types distributed around the globe together with radiative transfer modeling for assessing theoretical accuracies from both space and in-situ retrieval algorithms.-

Comparing OGVI values to similar products generated by other independent sensors co-located and quasi simultaneously acquired data.

→ **issue: which FAPAR definition.**

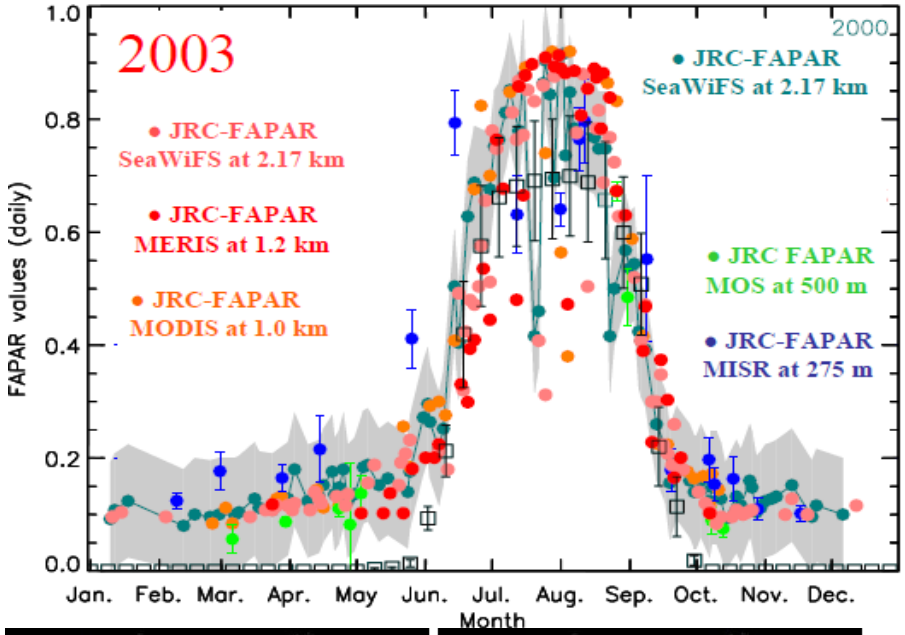
- Comparing against ground-estimates of FAPAR.

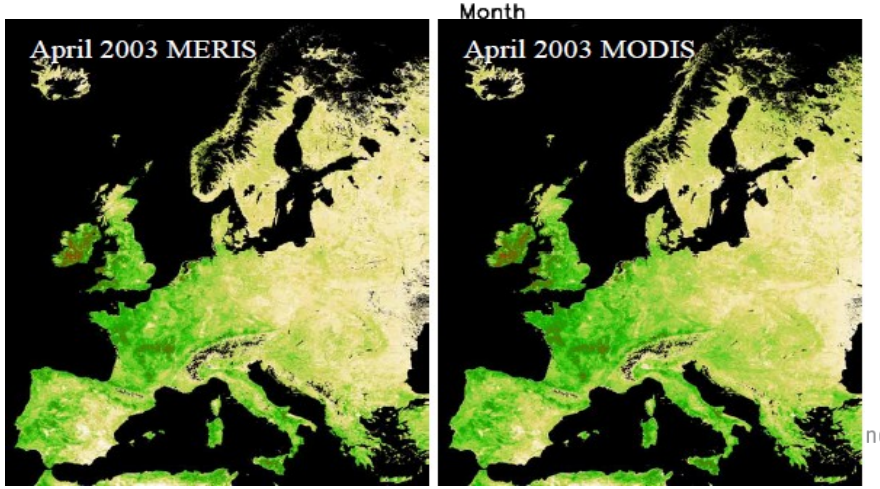
Issues:

- Date and time of acquisition
- Spatial resolution: in-situ measurements at very high resolution (1 m) to be extrapolated at the medium resolution pixel (sample numbers and spatial distribution, impact of horizontal fluxes)

→ **"Choice of 'truth' strongly impacts validation results."**

**See Presentation from Nadine Gobron on Wednesday at 14:45**



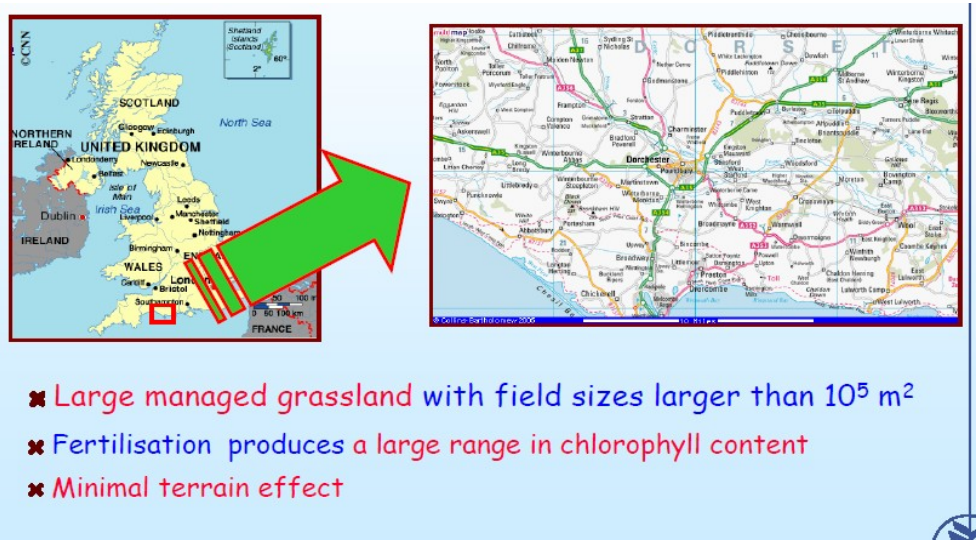
# Land OCTI validation

MTCI makes use of the high spectral resolution of the Medium Resolution Imaging Spectrometer to track the position of the Red Edge (Dash and Curran, 2004).

$$MTCI = \frac{R_{Band10} - R_{Band9}}{R_{Band9} - R_{Band8}}$$

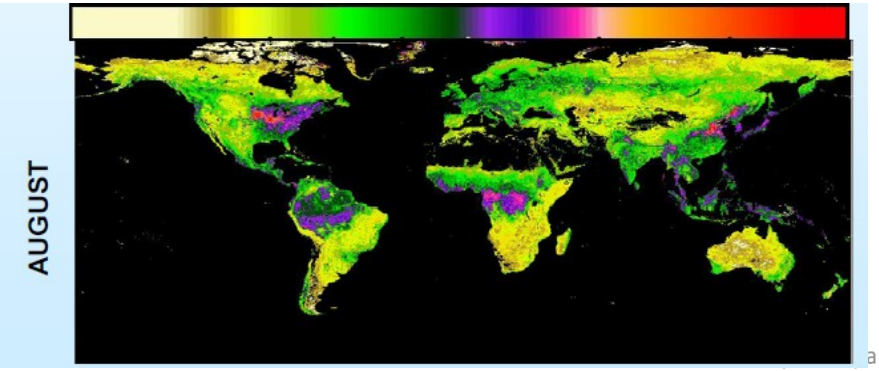
" The magnitude of the MTCI is positively related to the total chlorophyll content.

" This, in turn, is a function of chlorophyll concentration and leaf area index which reflect plant growth and biomass.

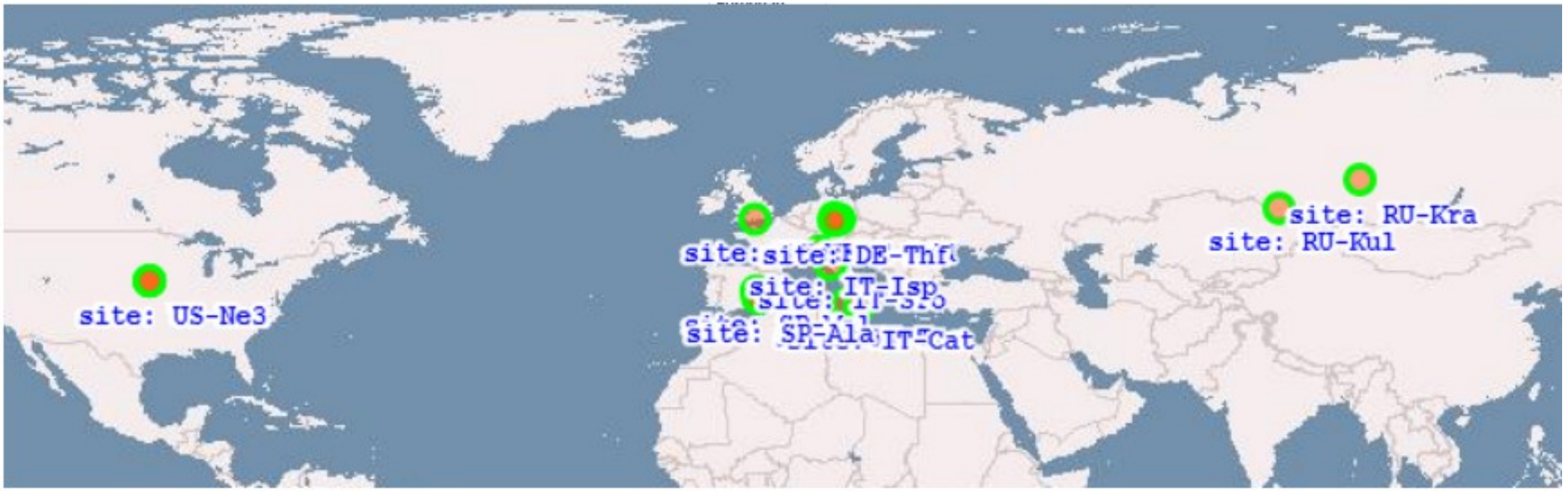



→ Ground data of chlorophyll

→ Joint campaign for OCTI, OGVI (LST tbc)
Compact Airborne Spectrographic Imager (CASI) imagery.



# OLCI land validation Site – N.Gobron – J.Dash




The sites are different in term of land processes and sample (semi)-arid, agricultural cover and various forest types. They are either part of long term networks (Fluxnet, ICOS) or MTCI validation campaign or others EO satellite core sites.

→ **Systematic extraction over the selected sites**

# Sentinel-3 Validation Team – S3VT

- Call to establish a Sentinel-3 validation team in 2012 and ~80 proposals received and selected.
- Four S3VT sub-groups will be established, co-led by ESA/EUMETSAT staff, on
  - Ocean colour (37 projects, conveners: Huot, Kwiatkowska)
  - Altimetry (23 projects, conveners: Scharro, Femenias)
  - Sea and ice surface temperature (9 projects, conveners: Donlon, O'Carroll)
  - Land parameters (8 projects, conveners: Goryl, Wilson)

  (Cross cutting projects: 3)
- ESA presently assesses the data requests: Sentinel-3 product size is substantial and hence data access/delivery to cal/val users needs to be appropriately sized.
- Data availability and data quality will follow a progressive ramp-up scenario starting at launch.
- Cal/val data access will be facilitated
  - Directly through the Mission Performance Framework, and/or
  - Through the ground segment, and/or
  - National mirror sites, via the collaborative ground segment
- Data extraction tools/toolboxs will be available.

# Sentinel-3 Validation Team – S3VT

## ❑Sentinel-3 Core Land Products :

- OLCI - OGVI – FAPAR , OLCI - OCTI – Terrestrial Chlorophyll Index
- SLSTR: Land Surface Temperature
- SLSTR: Fire Radiative Power
- SYNERGY: Surface Reflectance and Aerosol
- SYNERGY: SPOT VGT continuation

## ❑Specific and strong working relation with Agencies (ex: NOAA, CNES)

## ❑8 “Land Proposals” have been received + 3 cross-domain

- **OLCI – Land Validation** → *Nadine Gobron (JRC), Jadunandan Dash (University Of Southampton) , Ernesto Lopez Baeza – (Universitat de Valencia ), Alessandro Cescatti , Carsten Gruening , Jean-Luc Widlowski (JRC)*

- **LST** → *Dr. Nichola Knox, (SANSA), Dr. Darren Ghent (U. of Leicester), Yunyue Yu (NOAA)*

- **FIRE** → *Dr. Arino (ESA), M.Wooster (UKCL) and Lynham Timothy (Natural Resources Canada), J. W. Kaiser (MPIC, KCL, ECMWF)*

- **SYNERGY** → *Dr. Else Swinnen* → *Consistency analysis between S3 SPOT VGT-like level2 products and Proba-V 1km resolution products*

- **Level 1 Vicarious Calibration** → *David Smith (RAL) Sentinel-3 Calibration Over Natural Sites (SCONS), Bertrand Fougnie (CNES) Vicarious Calibration for OLCI & SLSTR Statistical Approaches over Natural Targets*

- **Pixel Classification** → *Dr. Brockmann (BC)*

# Conclusion

- Sentinel-3 Core Products have been defined
  - "New" products will be added (Fire, Aerosol)

- Cal/Val Plan V1 has been released

- Cal/Val is being organised
  - MPC
  - S3VT
  - International environment
  - CEOS WGCV IVOS
  - CEOS WGCV LPV
  - Protocols are being defined
  - Tools and data extraction over test site
  - Strong heritage from ENVISAT

More information on the products, the algorithm, the satellite and the mission at:

**http://Sentinel.esa.int**

- Calibration is a key elements in the program
  - Radiometric, Spectral, geometric
  - IVOS methodologies
  - Genric approach: LANDNET, Vicarious Calibration (CNES, RAL, DIMITRI) → link to Sentinel-2

- Validation
  - Need to organise joint campaign (OGVI, OCTI, LST, SYN and Sentinel-2)
  - S3VT support

- Comparison and inter-calibration of ground instruments (ex: Tuz Gulu, MIAMI, Ocean Colour at Venice Tower)

# Back-Up Slides on:

# Data Policy and Data Access

*(from S3VT 1st meeting – Susanne Mecklenburg, ESA)*

# Interaction with users (II):
## *Sentinel data access*

### SENTINEL DATA POLICY

**1. ESA: Joint Principals for a GMES Sentinel Data policy APPROVED**

- Access to Sentinel data will be free, full and open.
- Anybody can access acquired Sentinel data; in particular no difference is made between public, commercial and scientific use and in between European or Non-European users
- The licenses for the Sentinel data itself are free of charge.

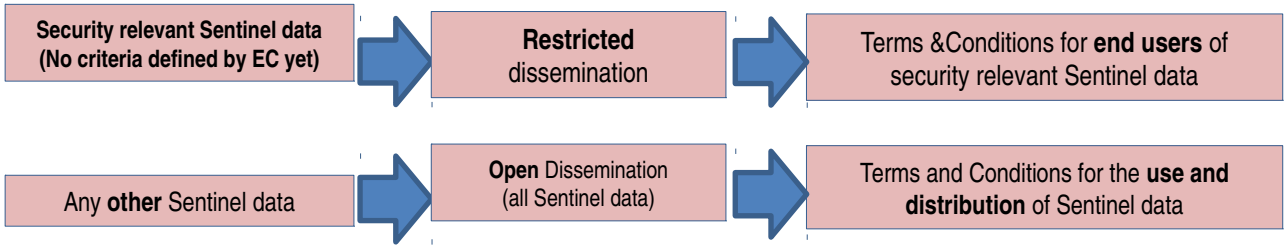
- **2. EC: Commission Delegated Regulation APPROVED** (EU) No../.. of 12.7.2013 establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information (two different regimes of data dissemination):

### DATA ACCESS IN PRACTICAL TERMS

Free, full and open data policy versus CSC data access funding – dedicated access per user type

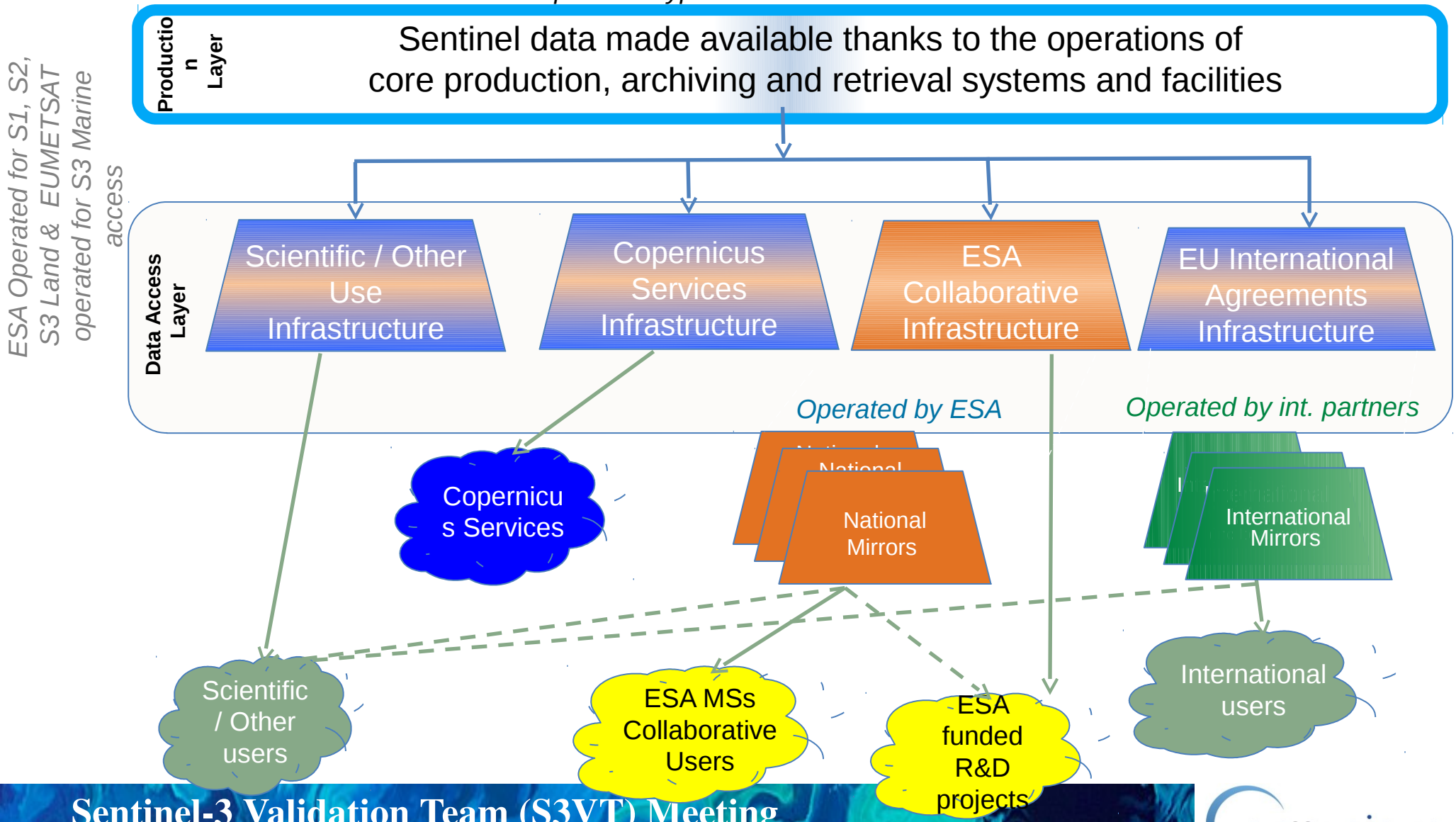
- ❑ Copernicus services → Coordinated Data Access System (CDS)
- ❑ ESA MSs Collaborative Users → national mirror sites
- ❑ ESA funded R&D projects → rolling archive on ESA funded dedicated distribution platform and/or ESA member states ' national mirror sites
- ❑ International users → International mirror sites
- ❑ Scientific/other users (i.e. not covered under any of the above groups) → rolling archive on ESA funded dedicated distribution platform

**Data access will follow ramp-up scenario (satellite commissioning → establish links to Copernicus core services and collaborative ground segment for national use → … → routine operations)**



# Interaction with users (II):

*Free, full and open data policy versus CSC data access funding – dedicated access per user type*



# DATA ACCESS SERVICE INFRASTRUCTURE
## *COPERNICUS SERVICES*

### Copernicus Services Access

**Committed performances for Copernicus services operations**

*(Operations based on service level agreements funded by EU Copernicus operations MFF budget)*

- **Registration based on a user request verified according to EU eligibility rules**
- **the free data access include:**

Access to NRT/24h and consolidated Sentinels products

Access to the different Copernicus Contributing Missions data

On-demand production

Access via user available bandwidth to the Copernicus backbone with committed reliability performances

EUMETCAST access for Sentinel-3 marine products

Dedicated data sets generation (CORE DATASETS e.g. land coverage)

Possibility of requesting ADDITIONAL DATASETS

Full time access to emergency services (24h/7/365, incl. rush mode) (for authorized users)

Service Desk support through dedicated user account management

Access to GCMs data, according to GSCDA Terms and Conditions

**Access Points**

ESA & EUMETSAT catalogues & dedicated servers, EUMETCAST services for Sentinel-3 Marine

# DATA ACCESS SERVICE INFRASTRUCTURE
## *ESA COLLABORATIVE ACCESS*

### ESA Collaborative Access

**Targeted performances to support ESA Member States**

*(Operations defined through dedicated agreements*

*for a limited number of interfaces funded by ESA GMES Segment-3 budget)*

- **User account pre-registration based on the terms of agreement**
- **The free data access include:**

- Access to a dedicated rolling archive of the Sentinel NRT/24h and consolidated Sentinels products
- Access via user available bandwidth to a dedicated dissemination bandwidth with committed reliability and performances
- Dedicated support for limited on-request data set generation or on-demand processing

**Access Points**

Rolling archive Data Hub server supporting dedicated product discovery and ftp & http downloads

# DATA ACCESS SERVICE INFRASTRUCTURE
## *EU INTERNATIONAL AGREEMENT*

### EU International Agreement

**Targeted performances to support EU International Agreements**

*(Operations defined through dedicated agreements for a limited number of interfaces funded by EU Copernicus budget)*

- **User account pre-registration based on the terms of agreement**
- **The free data access include:**

Access to a dedicated rolling archive of the Sentinel NRT/24h and consolidated Sentinels products

Access via user available bandwidth to a dedicated dissemination bandwidth with committed reliability and performances

Dedicated support for limited on-request data set generation or on-demand processing

**Access Points**

Rolling archive server supporting dedicated product discovery and ftp & http downloads,

EUMETCAST services for Sentinel-3 Marine

# DATA ACCESS SERVICE INFRASTRUCTURE
## *SCIENTIFIC AND OTHER USER*

### Scientific / Other Use of Sentinel data

**Shared and open resources for scientific and other use accesses**

*(Access funded by EU Copernicus budget and granted to all potential users to be confirmed)*

- **User self-registration**
- **The free data access includes:**

Access to a dedicated **Rolling Archive** of a consolidated production baseline (products availability may be deferred)

Access **via user available bandwidth** to a dedicated dissemination bandwidth ensuring gateway to the scientific GEANT backbone

**Access configured to avoid resources saturation** resulting from massive downloads by a limited user community (e.g. maximum number of parallel downloads, maximum volume per retrieval,…)

**Access Points**

**Rolling archive server** supporting dedicated product discovery and http downloads, EUMETCAST services for Sentinel-3 Marine