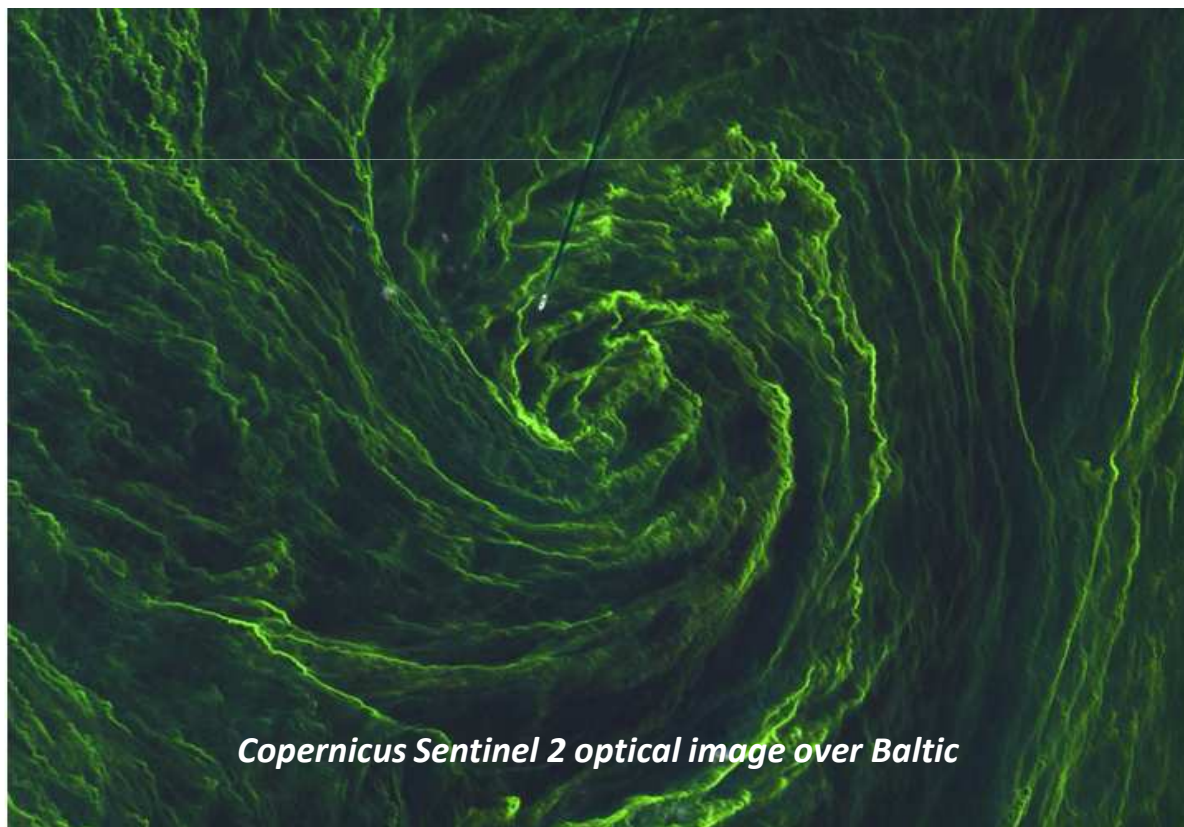


# OSTST PLENARY SESSION

CNES / NOAA / EUMETSAT / NASA / ESA program status  
*Program Managers*

## CNES OCEAN PROGRAM STATUS



*Copernicus Sentinel 2 optical image over Baltic*

**En route towards  
High Resolution  
Oceanography**

Philippe Escudier  
CNES Ocean Program Manager

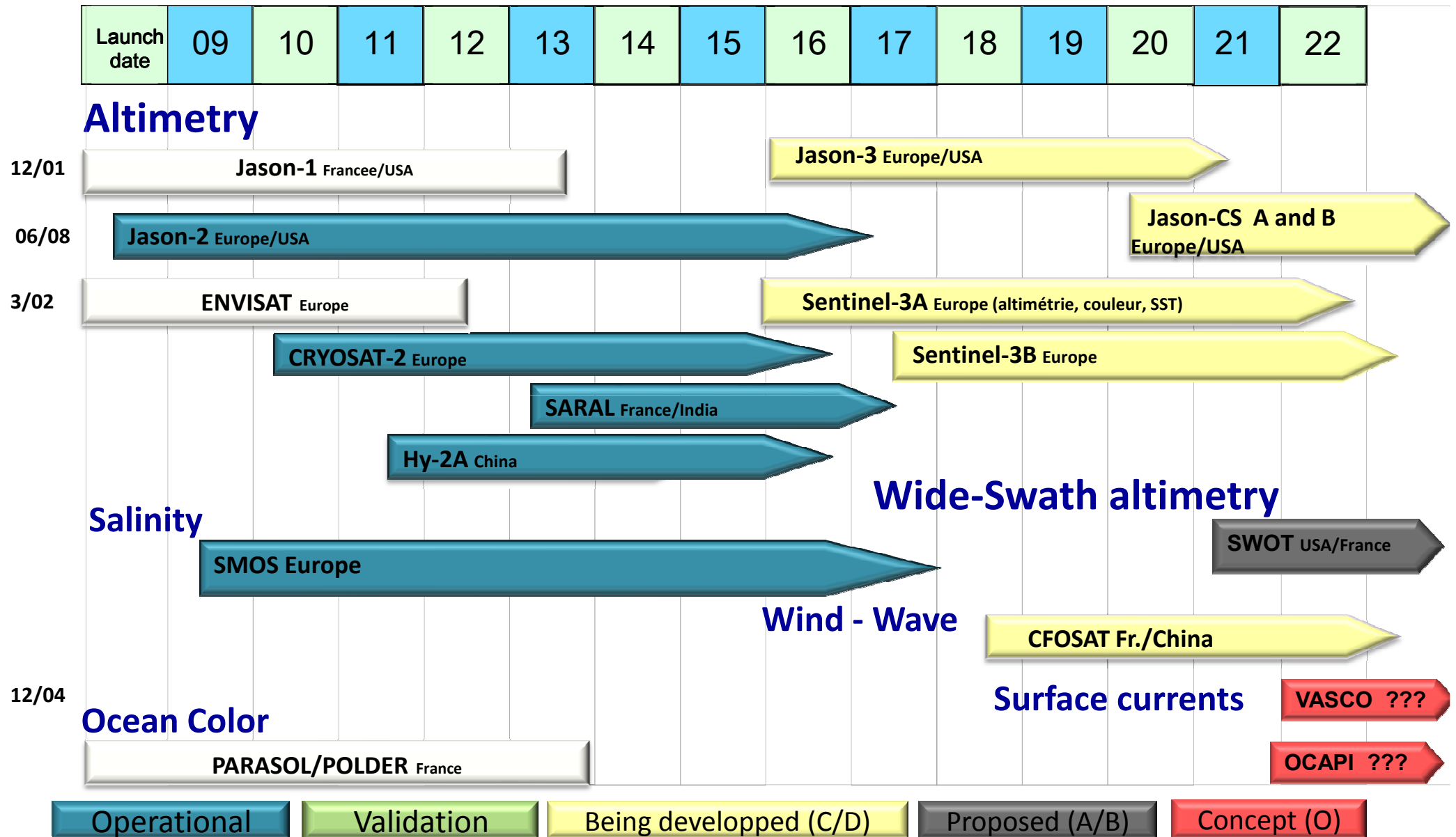
[Philippe.escudier@cnes.fr](mailto:Philippe.escudier@cnes.fr)

# FRENCH MULTI USERS PROSPECTIVE

## Priorities :

- High quality nadir altimetry to support medium resolution oceanography through multiple partnerships :
  - Long term monitoring
  - Guarantee product accuracy
  - Cross calibration between mission
  - High level products
- **Jason 2, Jason 3, Sentinel 3, HY-2, SARAL/ALTIKA, Sentinel 6/Jason CS**
- **Copernicus Marine Service**
  - DUACS products fully integrated in the Copernicus Marine Environment Service
- High resolution oceanography challenge :
  - Space resolution : Wide swath altimetry
    - Resolution of appropriate scales for :
      - Ocean atmosphere interactions monitoring
        - **SWOT**
        - **SMOS, CFOSAT, VASCO, IRT**
      - Ocean biology and ocean physics interactions
  - Time resolution : ocean color from geostationary orbit
    - **OCAPI**
  - Longer term perspective :  
Definition of the appropriate space measurement system appropriate to support the next phase of oceanography

# OCEAN MISSIONS @ CNES (PARTNERSHIPS)





# SCIENCE TEAM SUPPORT

## Wide Swath altimetry : SWOT TOSCA/ROSES AO

- 36 proposals received and reviewed on French side (including international contributions and partnerships)
  - 17 Ocean
  - 14 In-Land waters
  - 5 mixed : Ocean + In Land waters
- Selection announcement : mid November

## Nadir Altimetry : OSTST

- New AO for team selection in 2016
  - CNES will continue to support nadir altimetry science efforts :
    - Calval
    - New algorithm and new products
- SWOT perspective → new requirements for nadir altimetry products

## Wind/wave/sea state : CFOSAT

- International AO to be released beginning of 2017
  - Data policy to be finalized with Chinese partners

## Ocean Color : OCAPI

- Science team to support on-going CNES phase A open to international contribution



# **NOAA Jason Program Status**

**Ocean Surface Topography  
Science Team Meeting**

**Reston, Virginia**

**20-23 October, 2015**

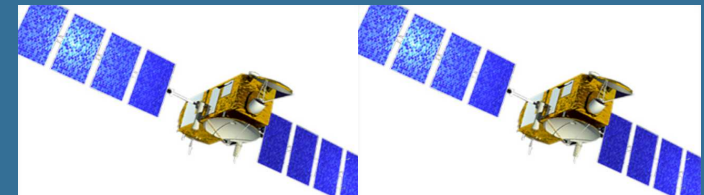
# NOAA Jason-2/OSTM Program

- Continued success!
- NOAA provides satellite command & control, data down-linking, and ground system processing.
- Excluding safe-holds, data availability was 99.9%, both during past REVEX annual period and past 7.5 years of operation, overall.
- Mission requirement 95%.



# NOAA Jason-3 Program

- Falcon 9 v1.1 launch failure on 28 June while transporting ISS resupply
- SpaceX leading failure investigation with help from NASA/LSP
- Jason-3 stored safely inside Payload Processing Facility at VAFB
- Successful transition of Jason-2 ground systems operations onto new (combined J-2/J-3) NOAA Jason Ground System, 30 September
- Stage 2 engine to undergo testing in October
- NOAA will control and down-link telemetry for both J-2 and J-3 at Fairbanks, Barrow, and Wallops
- First time that one agency will be responsible for managing both satellites flying 1 minute apart during Tandem Mission
- Partners committed to support a mid-December launch
- Falcon 9 Stage 2 is on critical path to launch in mid-December



# NOAA Jason-CS Program

- Baseline: Interleave Sampling Mode so that SAR and LRM can be directly cross-calibrated.
- Pending approval by Congress, NASA will assume overall responsibility for the US contribution to Jason-CS
- NOAA working with NASA to determine NOAA's role in support of the Jason-CS mission



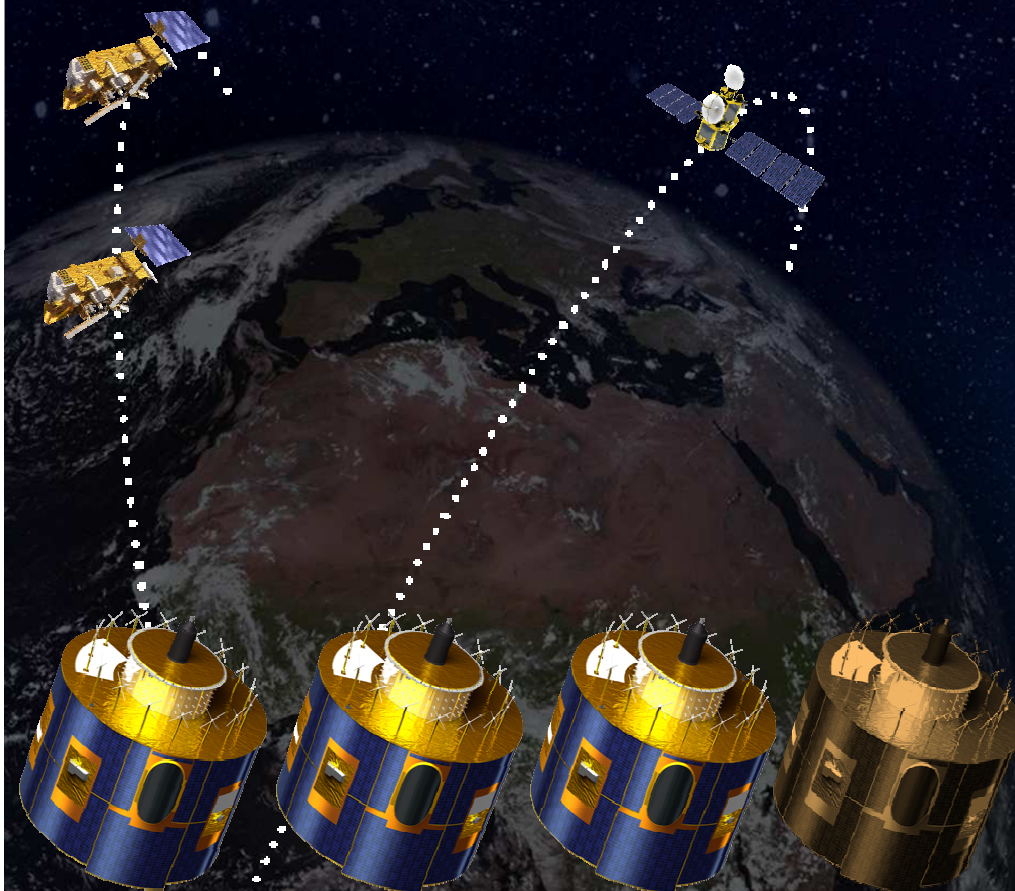


# EUMETSAT MARINE PROGRAMMES



**Francois PARISOT**

**OSTST  
Reston, October 2015**

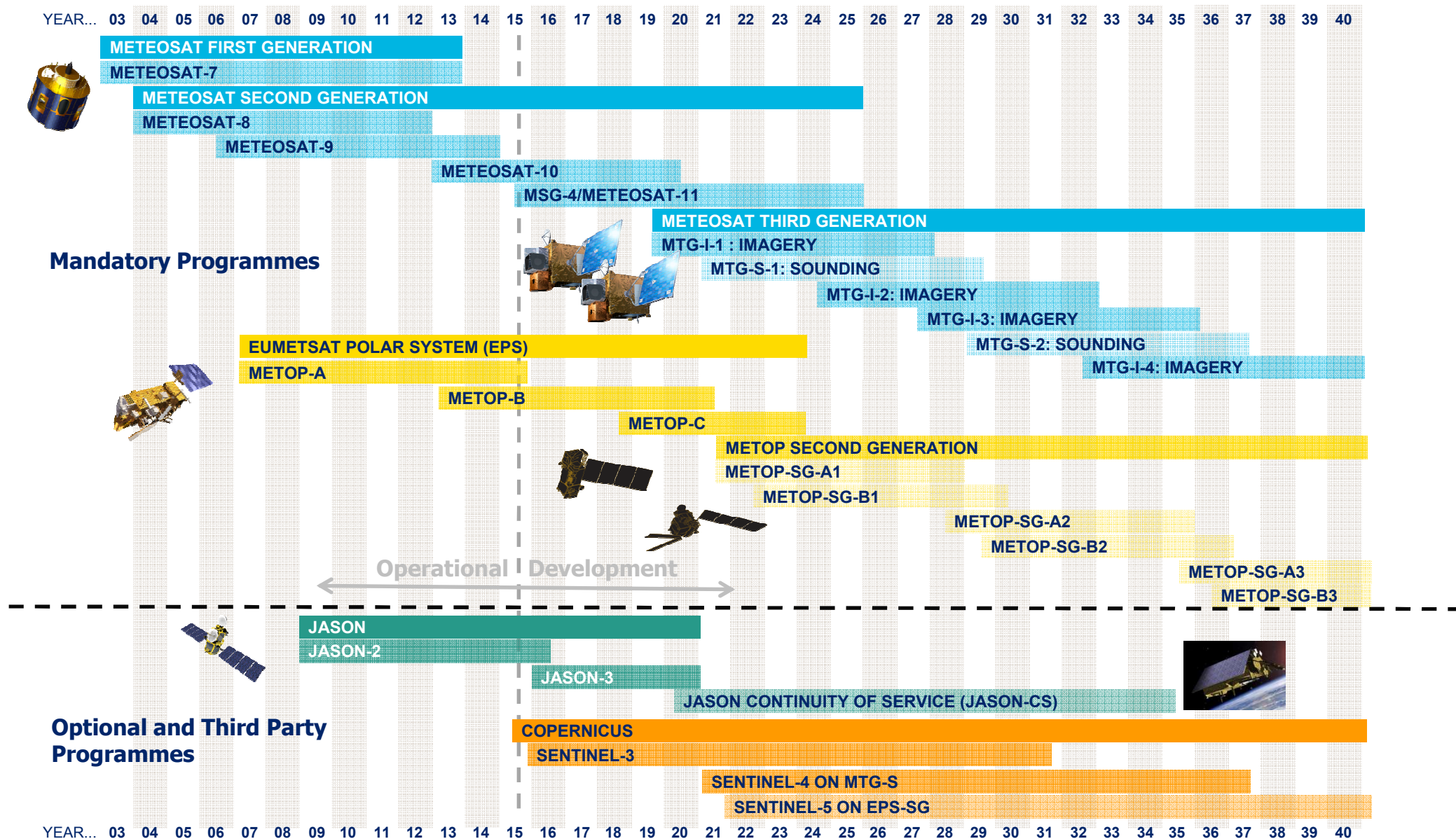


# EUMETSAT Participation in the COPERNICUS Program

On 7 November 2014, EUM signed the Copernicus Delegation Agreement with the European Commission with the following delegated tasks:

- In co-operation with ESA, EUMETSAT is preparing for the operations of the
  - Sentinel-3 Marine Mission
  - Sentinel-4 Atmospheric Chemistry Mission from GEO Orbit on MTG
  - Sentinel-5 Atmospheric Chemistry Mission from LEO Orbit on EPS-SG
- In co-operation with CNES, NOAA and NASA, EUMETSAT is preparing for the operations of the High Precision Ocean Altimetry (HPOA) Mission of Jason-3
- In co-operation with ESA, CNES, NOAA and NASA, EUMETSAT is preparing for the operations of the High Precision Ocean Altimetry (HPOA) Mission of Sentinel 6 / Jason-CS (Continuity of Service)

# EUMETSAT Programmes Overview





# Sentinel-3: Sharing Operational Tasks & Operations Concept Timeline



Operations, maintenance and evolution of

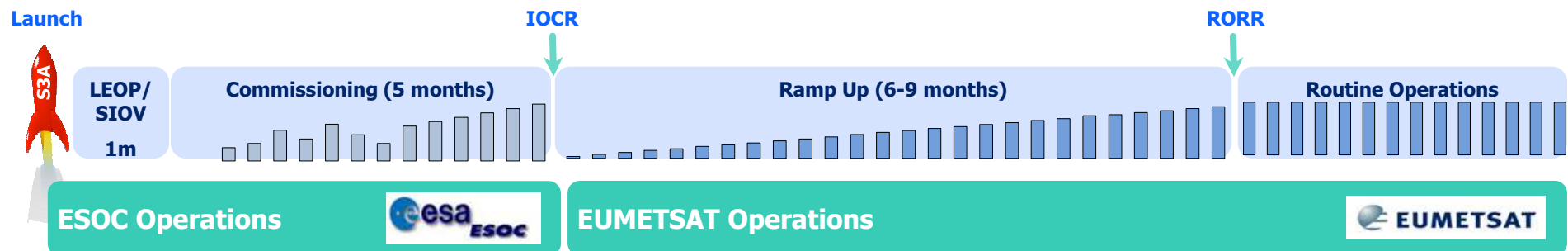
- ❑ the Flight Operations Segment for LEOP and Commissioning phases
- ❑ shared multi-mission services (e.g. X-Band acquisition, POD)
- ❑ the **Sentinel-3 Land Payload Data Ground Segment**

and Post-Launch space segment support activities



Operations, maintenance and evolution of

- ❑ the Flight Operations Segment for routine phase, including mission planning, and
- ❑ the **Sentinel-3 Marine Payload Data Ground Segment** including the EUMETSAT multi-mission facilities



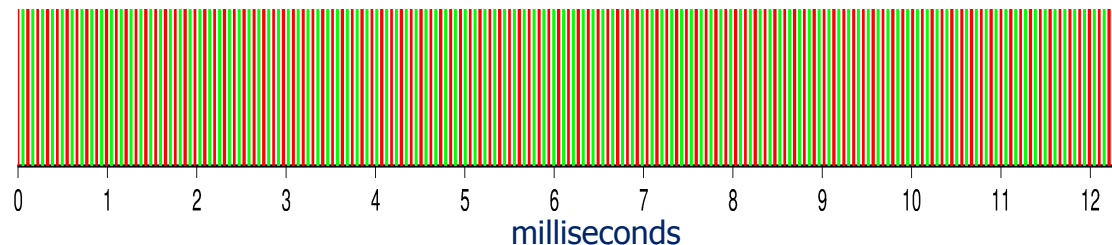
# Sentinel 6 / Jason-CS: Continuity of Service for Topography

- **Prime mission objective: Continue high-precision global sea level time series**  
with an error on sea level trend  $< 1$  mm/year

- Continuity with past altimeters in the reference series (all operated in LRM)

- Jason-CS altimeter "Interleaved" mode:

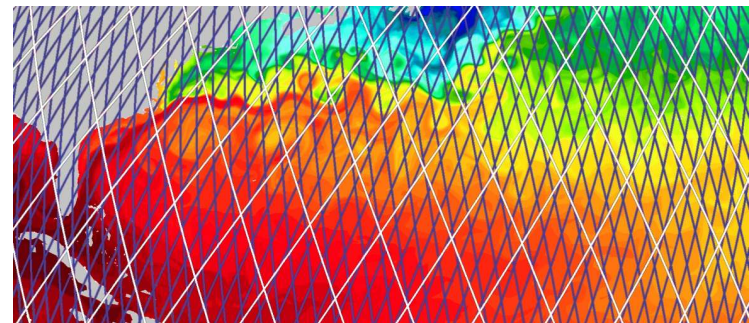
- SAR and LRM simultaneously
- no "burst", continuous Tx/Rx
- PRF  $\sim 9$  kHz



- Interleaved mode ready for higher resolution (SAR mode) future but systematically linking with the past (LRM simultaneously)
- Expected to be a breakthrough: access to sub-mesoscale variability of currents

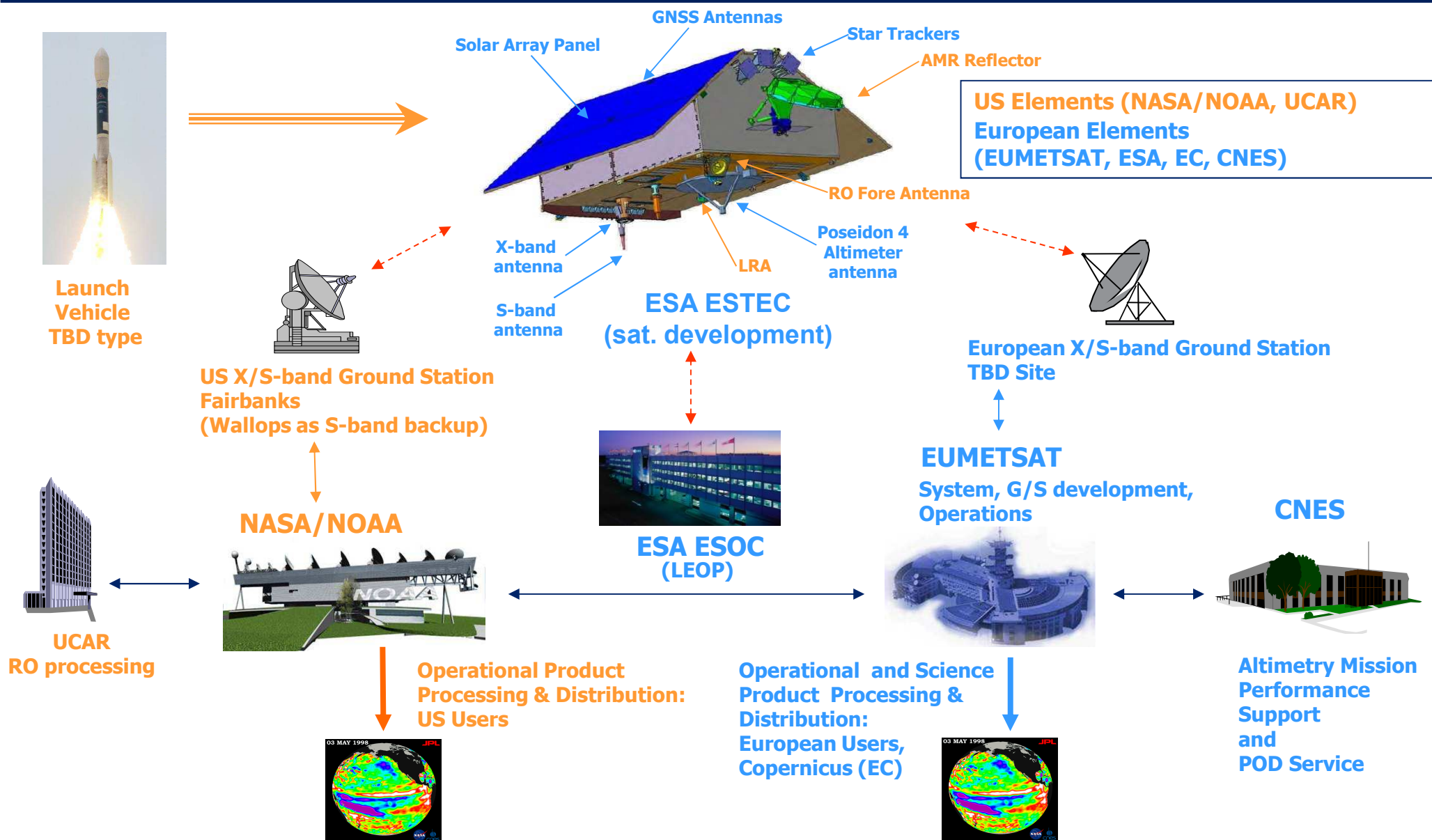
- Combination with Sentinel-3:

- Jason as the reference for cross-calibration and enhancement of all altimeter missions
- Jason and Sentinel-3 orbits complement each other for optimum sampling of variability of ocean circulation



Sentinel-3 (blue) and Jason-3/CS (white) orbital paths in the west tropical Atlantic  
(source: MyOcean)

# Sentinel 6 / Jason-CS System Elements



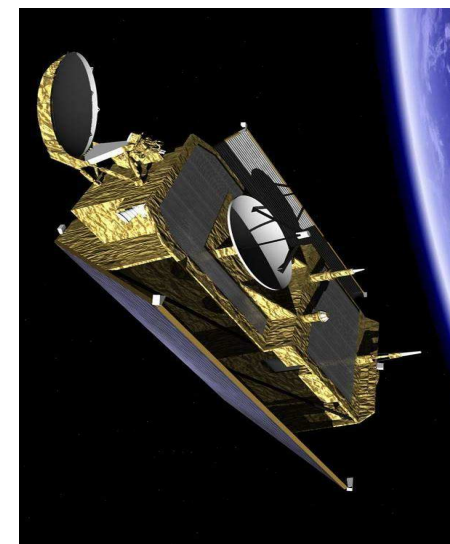
# Sentinel 6 / Jason-CS

- Technical differences with past Jason's
  - New platform, significant upgrade on instruments, new altimeter mode
  - 5.5 years nominal lifetime, with additional 2 years for spares and consumables
  - Addition of Radio Occultation as secondary mission
  - ESA does the LEOP, then hand over to EUMETSAT
  - No hand over of satellite control to NOAA, remains at EUMETSAT after LEOP for the complete lifetime
  - Topography processing at EUMETSAT
  - Space Debris and De orbitation requirement
- Ongoing analysis
  - Consolidation of the Performance figures: Jason-3 requirements or better (High Resolution)
  - Ongoing study on Sea State Bias (SAR)
  - Product baseline refinement
- See poster on Sentinel-6/Jason-CS Altimeter Products and Performance Budget

# Status of Jason-3 and Sentinel 6 / Jason-CS

## Sentinel 6 / Jason-CS

- Space Segment Phase C/D has started begin 2015 after successful PDR end of 2014.
- System Requirements Review led by EUM successfully closed in July with participation of all partners (ESA, CNES, NOAA and NASA)
- **Jason-CS optional programme approved at EUM on 9 September**
- Cooperation Agreement with ESA almost finalized, top-level tri-partite MoU under iteration.
- Sentinel-6 / Jason-CS Satellite A launch planned in 2020



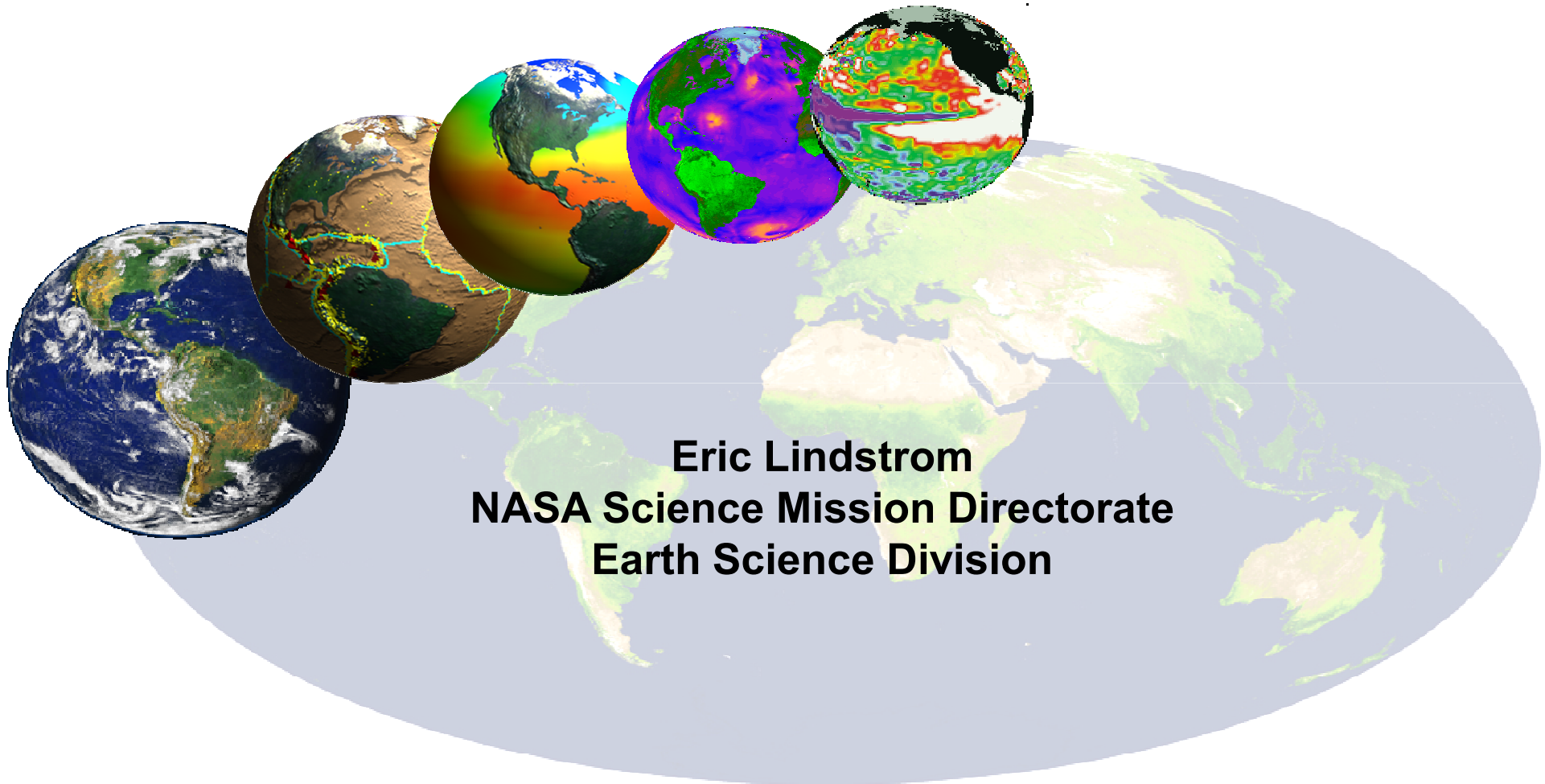
## Jason-3

- Satellite was scheduled to be launched begin of August, but postponed due to Falcon9 launch failure on 28 June
- Pending outcome of the investigation board and schedule for return-to-flight ,J3 launch will be rescheduled.
- Earliest launch date expected is mid december 2015, close cooperation and monitoring together with the partners.





# NASA Headquarters Perspectives @ OSTST 2015



**Eric Lindstrom  
NASA Science Mission Directorate  
Earth Science Division**



# NASA Physical Oceanography

- Eric Lindstrom
  - NASA ESD Climate Focus Area Lead (Physical Oceanography, Cryosphere, and Global Modeling and Analysis Programs)
  - NASA Mission Program Scientist – Aquarius, SMAP Salinity, QuikSCAT, RapidSCAT (on ISS), **OSTM/Jason-2, Jason-3, Jason-CS/Sentinel-6, SWOT**
  - Co-Chair, US Interagency Ocean Observation Committee
  - Co-Chair, Global Ocean Observing System (GOOS) Steering Committee

# Physical Oceanography News from NASA



- Aquarius/SAC-D
  - Mission-ending anomaly in June 2015
  - Aquarius Data Record is 3 years and 9 months
  - Now charged with developing a continuing record using SMAP and any other available data.
- QuikSCAT and RapidSCAT
  - RapidSCAT anomalies over summer 2015 require re-calibration (for climate record)
  - QuikSCAT termination postponed from Oct 2015 to at least Feb 2016.
  - OVWST task team working on a strategy for maintaining wind climate record from all available resources (Frank Wentz, task team chair)
- Surface Water Ocean Topography (SWOT) Mission
  - Science Team is competed ROSES (NASA) and TOSCA(CNES) in 2015
  - 67 proposals reviewed in USA
  - 36 proposals reviewed in France
  - Announcing results mid-November 2015
  - First meeting in Spring 2016 in USA



# ROSES News from NASA



- ~Five Physical Oceanography-related announcements in ROSES 2016 (formulation finished by Dec 2015)
  - Physical Oceanography (regular annual call for proposals)
  - NASA Ocean Salinity Science Team
    - New team for the post-Aquarius period. L-Band data from SMAP now being used to generate a salinity product.
  - NASA Sea Level Change Team (TBC)
    - Currently funded through early 2017. Need to formulate the follow-on/continuation (Collaborating Programs: Cryo, ESI, ESDIS)
  - Interdisciplinary Science (TBC)
    - “Living in a Moving Ocean” (joint analysis of ocean surface currents, animal tracking data, and marine debris)
  - International Ocean Surface Topography Science Team
    - Details formulated during and after this week’s meeting
    - Four years/CY2017-2020, ~20 selections total ~\$4M/yr.

# OSTST News from NASA



- ROSES 2016 Timeline (TBC)
  - ROSES 2016 Announcement ~ 14 Feb 2016
  - Letters of Intent 30 April 2016
  - Proposals 30 May 2016
- Content (TBC)
  - Evolution from prior announcement
  - May include explicit connections with NASA Sea Level Change Team
- Mission Specific Items
  - TOPEX-Poseidon/Reprocessing
  - Jason-1/GDR-E recently published
  - Jason-2/Currently the core of the altimetry Climate Data Record
  - Jason-3/ Awaiting new launch date. Perhaps as early as December.
  - Jason-CS A&B (extends high precision altimetry through ~2030)
    - Meetings on umbrella agreement next week and JSG
  - SWOT (NASA/CNES)/LRD~Oct 2020. Entry into Phase C in 2<sup>nd</sup> Qtr 2016.

# ESA Programmes Status

- Envisat and ERS Reprocessing
- CryoSat Mission Status
- GOCE Activities (1 slide)
- SMOS Mission Status
- Sentinel-3 Mission Status
- Jason-CS/Sentinel-6 (Pierrik Vuilleumier's talk @10:10)
- Data access
- Training and outreach

Jérôme Benveniste, OSTST 2015, Reston, VA, USA

- ❑ In 2012, ENVISAT mission was interrupted, after 10 years of altimetric measurements. Three years later, the mission's database is still maintained, studied and used. The historical database still evolves.
- ❑ **The ongoing reprocessing reprocessing** features tens of algorithm improvements. The major evolutions are listed below with an overview on the expected effects on errors reduction at different scales.
  - ❑ **Large and short scales error reduction: MSL improvement and SSH variance at crossovers decrease**
    - ❑ New orbit standard
    - ❑ New wet tropospheric corrections
    - ❑ PTR Internal Path Delay drift
    - ❑ Look Up Tables for small waves correction
    - ❑ New ionospheric correction filtering method
  - ❑ **New fields available !!**
    - ❑ ERA-Interim meteo Fields (dry/wet tropospheric corrections)
    - ❑ 2 new wet tropospheric corrections (UoP GPD, from Gamma & SST)
    - ❑ ACE
    - ❑ LEGOS Echo and Geo correction over ice shelves
    - ❑ EGM 2008
    - ❑ MSS DTU-10...
    - ❑ Individual Echoes (1800 Hz)

**Current Homogeneous dataset available on:**  
**<ftp://diss-nas fp.eo.esa.int>**  
**Envisat Corrected SSH products now available**  
**on ODES portal:**  
**<http://odes.altimetry.cnes.fr>**

- ❑ In 2012, ENVISAT mission was interrupted, after 10 years of altimetric measurements. Three years later, the mission's database is still maintained, studied and used. The historical database still evolves.
- ❑ **The ongoing reprocessing** features tens of algorithm improvements. The major evolutions are listed below with an overview on the expected effects on errors reduction at different scales.

- ❑ **Large and short scales error reduction: MSL improvement and crossovers decrease**

- ❑ New orbit standard
- ❑ New wet tropospheric corrections
- ❑ PTP...

**The New GDR will be in NetCDF (Compliant with S3)  
New Product Handbook - December 2015  
Full V-3.0 data set availability in Summer 2016.**

**Products now available  
on ODES portal:  
<http://odes.altimetry.cnes.fr>**

- ❑ ... meteorological Fields (dry/wet tropospheric corrections)
- ❑ 2 new wet tropospheric corrections (UoP GPD, from Gamma & SST)
- ❑ ACE
- ❑ LEGOS Echo and Geo correction over ice shelves
- ❑ EGM 2008
- ❑ MSS DTU-10...
- ❑ Individual Echoes (1800 Hz)

## **Status**

- *ERS-1 and ERS-2 "REAPER" data are available since Q3 2014*
- *The reprocessed data set covers the period from July 1991 to June 2003*  
→ <https://earth.esa.int/>

## **Future Plans**

- *ESA intends to reprocess the ERS-1 and ERS-2 data sets and align them to the Envisat Altimetry V3.0*
- **REAPER\_2** *reprocessing will happen if funded in the frame of ESA EO Envelop Programme 5 (EOEP5) !*

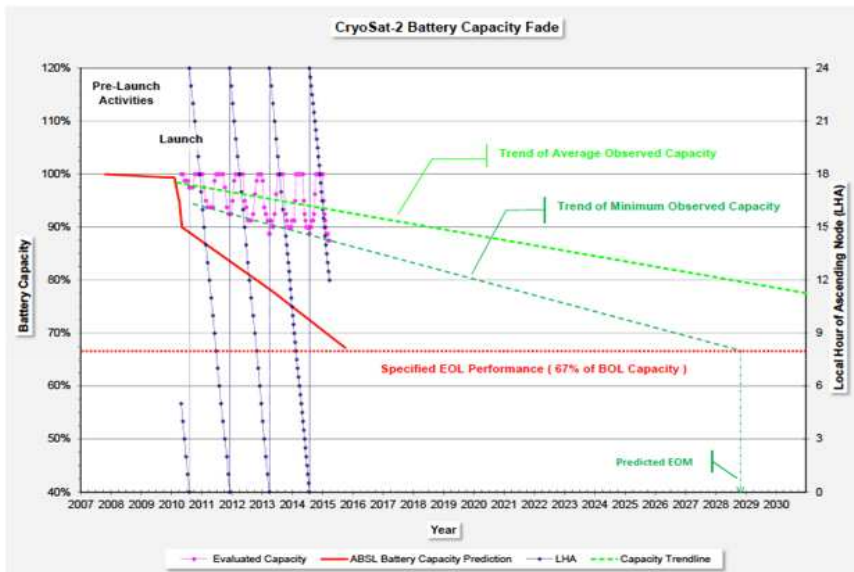
# CryoSat



# CryoSat: Space Segment Performance

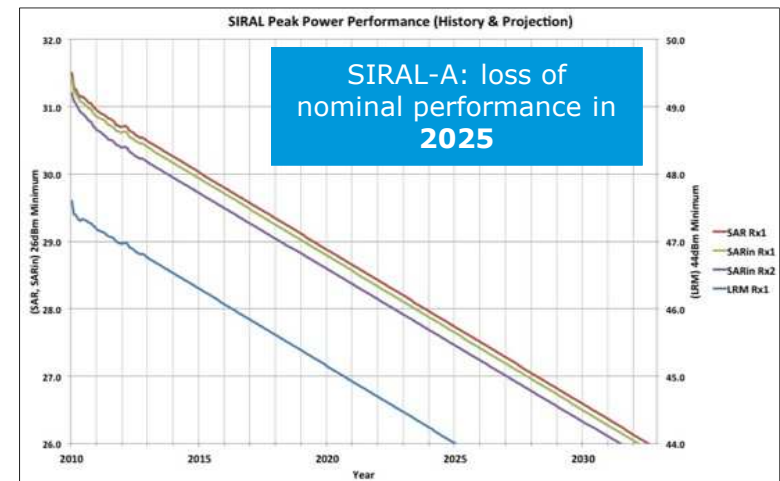


**No technical limitations to continue mission exploitation until 2025**



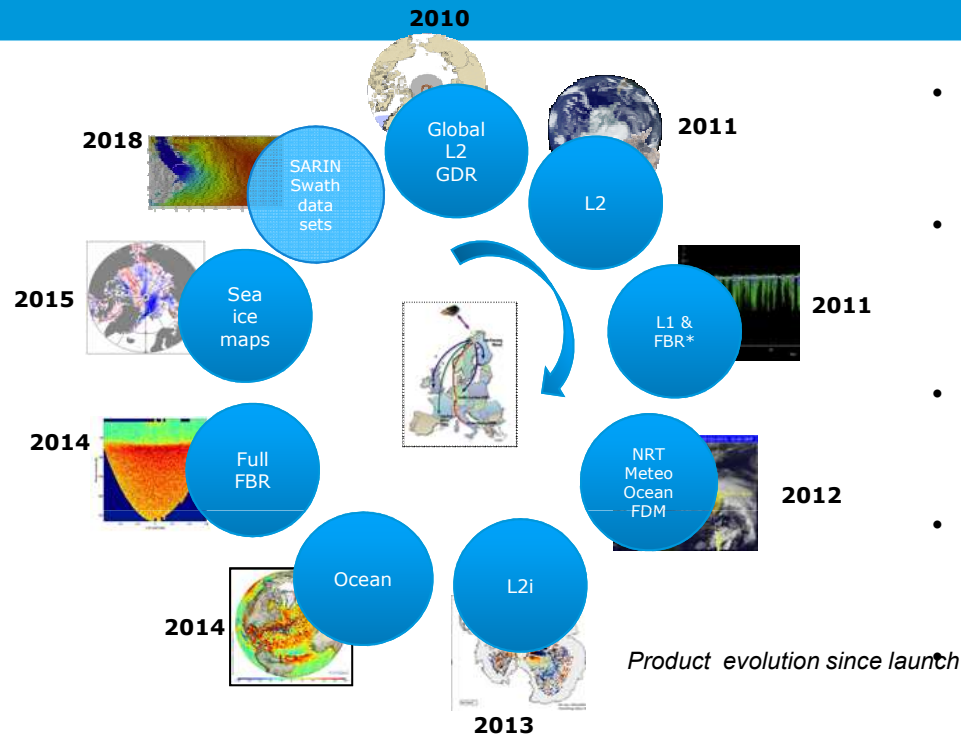
- **Platform** is fully operational with all subsystems in **Branch A** but the Power Control Data Unit (PCDU) since October 2013, after a component failure of the Telemetry acquisition chain.
- **Battery** is fading much less than predicted. Recent trend shows that 67% (end-of-mission) will be reached in **2029** (worst case).
- The average yearly **fuel usage** is 500 grams (much less than predicted). End of fuel (worst case): **2027**
- **Star Trackers** (STR) are degrading according to specifications but with different profiles. New STR software is under development to **improve robustness and performance**
- Expected end-of-life of **other subsystems** not earlier than **2025**
- Satellite resources are exploited to maximize scientific return and preserve life-time of all subsystems. **Platform availability** is **99.78%**
- There have been **ten collision avoidance manoeuvres** since launch

- Payload is very stable. All specifications have been surpassed
- **Fundamental radar characteristics** such as *Range Impulse Mode*, *Path Delay* and *Gain Variation* are **stable in time** and show linear degradation that is corrected by ground processing with no impact on data quality.
- Projection of **loss of nominal performance of SIRAL-A** will happen not earlier than **2025 with Branch B still available**
- **Payload availability is 99.45%**





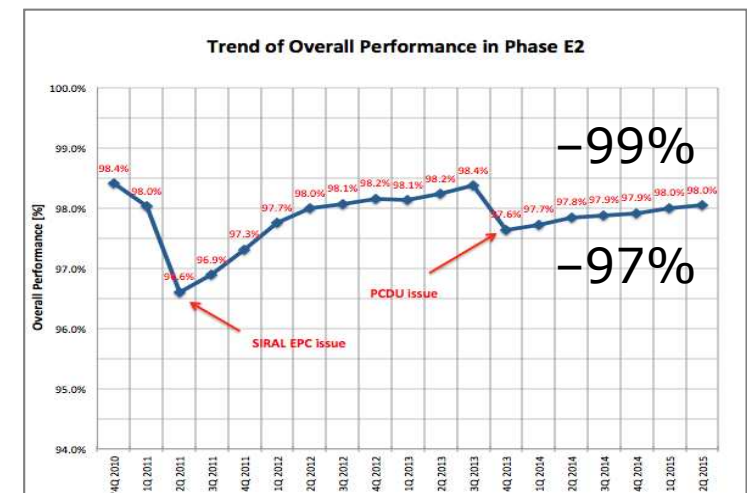
# CryoSat: Ground Segment Performance



- Excellent reliability of the ground segment continuously evolving in capacity to adapt to new products. Well fitted to continue exploitation until **2021**
  - Product Portfolio continuously evolving taking into consideration new demands and novel applications from worldwide community, including NRT. New product baseline foreseen in **2017** and **2019**
  - Reprocessing campaigns follow the releases of new baselines. 2<sup>nd</sup> reprocessing campaign to be completed in **2015**
  - High data availability for science community. Overall performance of the mission is **98.0%** well above mission expectation (i.e. 94%)
- Free-and-open data disseminated to users is around **50GB/day**

## NRT & Operational use

- Fast generation products (**NRT**) for use of meteo, marine forecasting and operational agencies (ECMWF, CNES, NOAA, DUACS, WMO GTS)
- Sea-ice thickness interactive maps (i.e. every 2, 14 and 30 days) available to Polar operational agencies

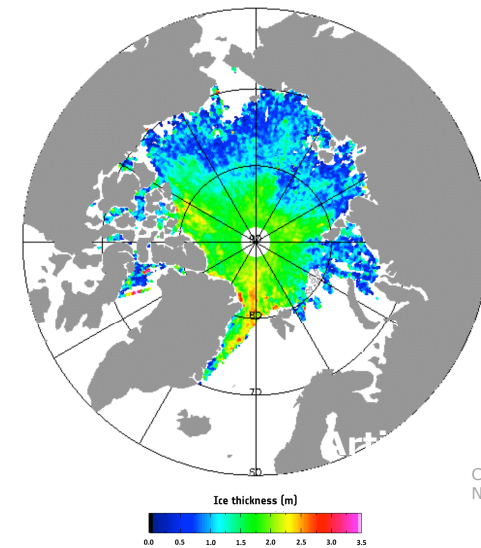


# CryoSat: Scientific achievements – Sea ice

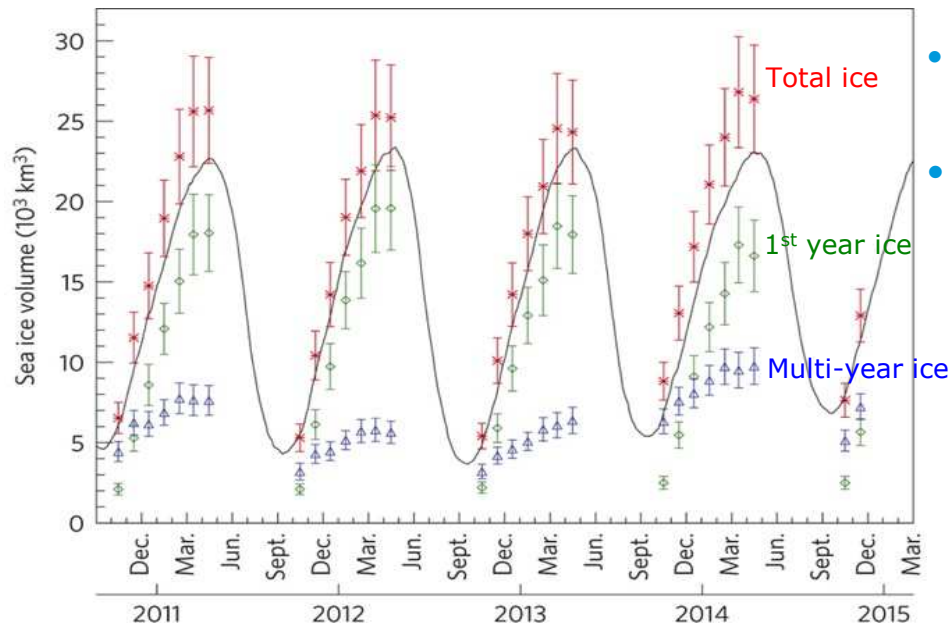


**Unique Polar Mission with extensive geographical coverage, accurate volume estimation of ice and exclusive ability with SAR/SARIN technology**

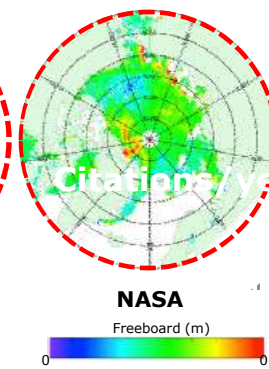
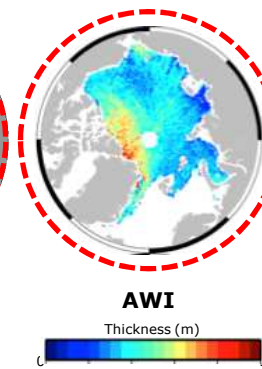
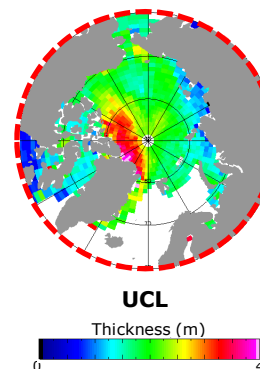
- Providing **robustness** extensive **sea-ice thickness** measurements and trends (up to 88 latitude) at unprecedented accuracy with better spatial resolution and tenfold improvement in capacity to detect floes.
- Extending the **climate time record** started in early nineties, revealing complete seasonal and annual distribution of signals
- Contributing to the improvements of important **assimilation and forecasting models** (e.g. PIOMASS) at regional and global scale



Credits: R. L. Tilling et al.,  
Nature Geoscience, 2015



- **Sea-ice products available from three groups** (UCL, NASA, AWI). Others in preparations (e.g. FMI, CCI)
- Future work focussed on characterisation of snow load and Antarctica sea-ice



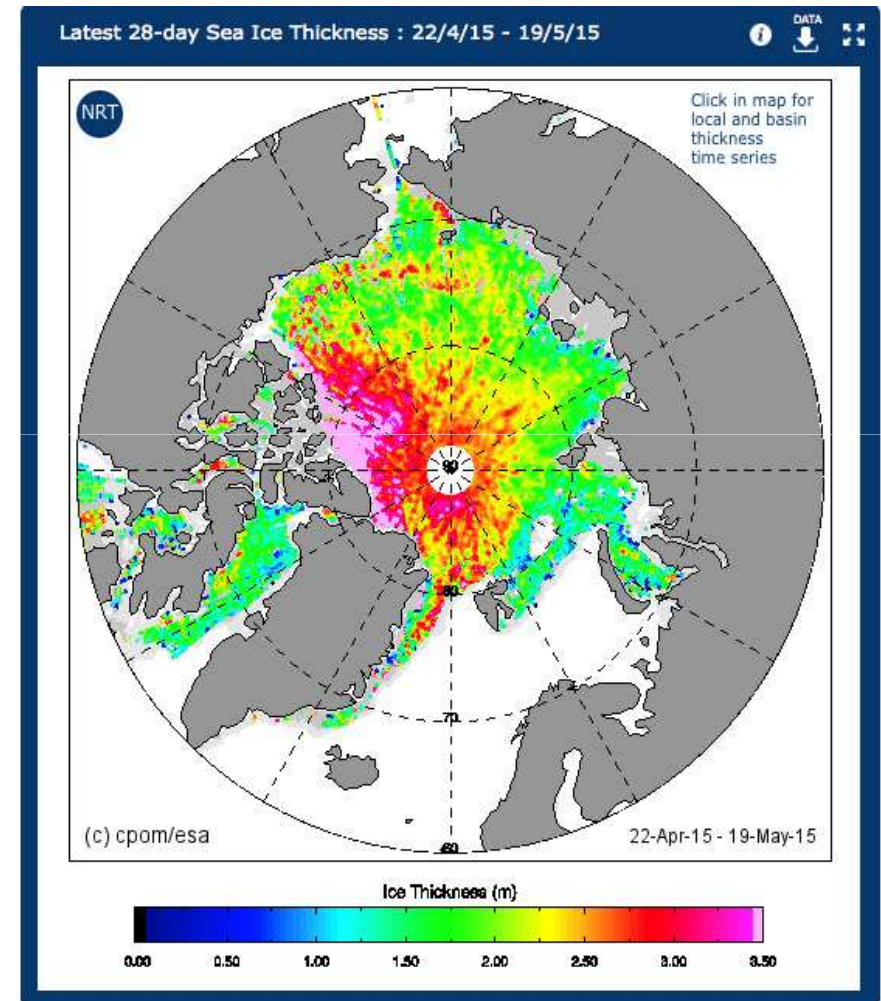
Space Agency

# CryoSat: Science achievements – Novel applications



**Stimulating new scientific streams for innovative applications and avenues for future research and potential operational activities**

Sea-ice thickness for polar operational users on 2d, 14d, 30d time lag



<http://www.cpom.ucl.ac.uk/csopr/seaice.html>

# CryoSat: Scientific achievements



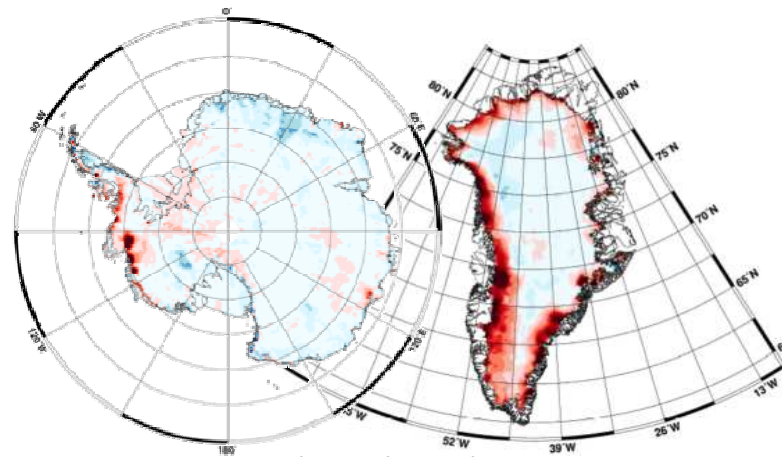
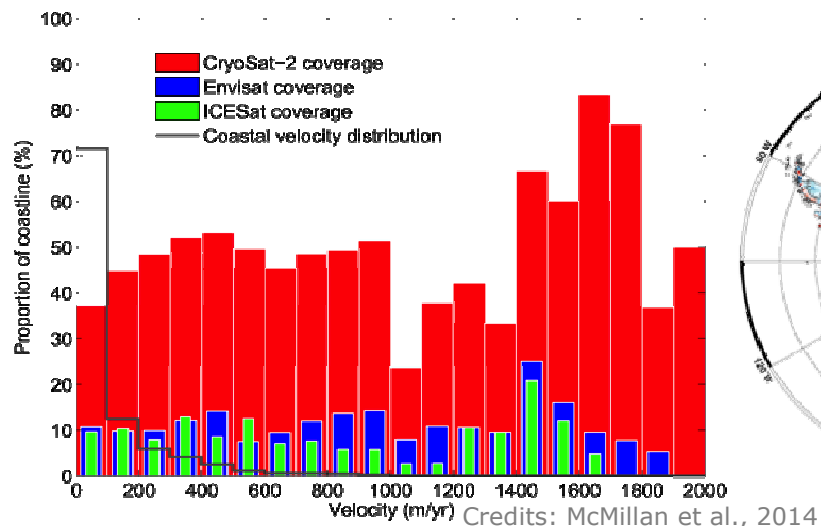
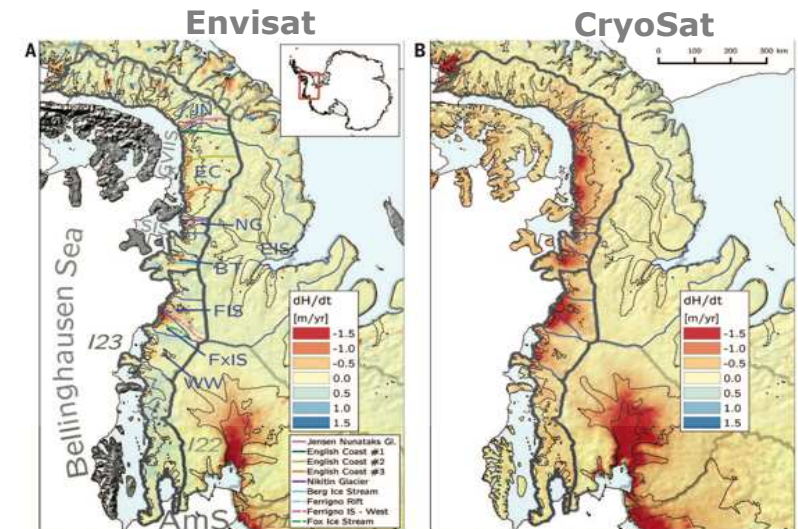
## Land ice

ice sheet mass balance

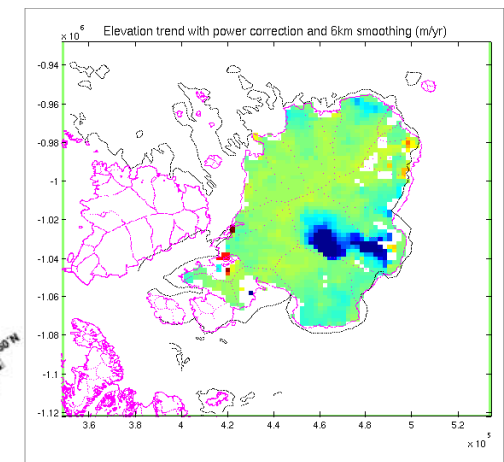
Glaciers mass balance

## Fundamental climate long term data

Wouters et  
alt., 2015



Credits: Helm et al., 2014

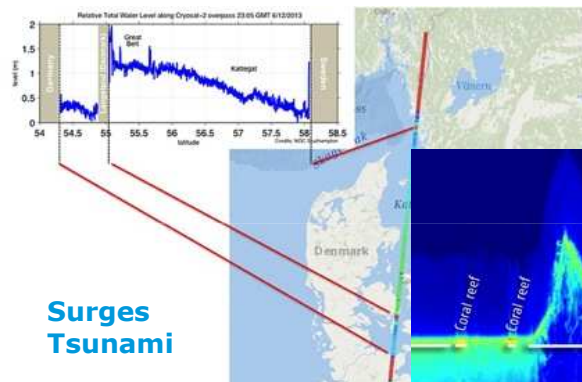




# CryoSat: Scientific achievements – Beyond ice

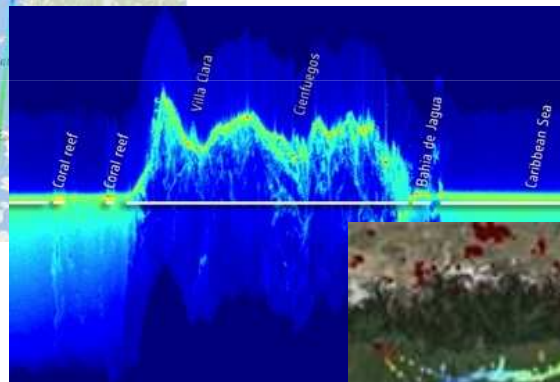


CryoSat is providing high quality data for Oceanography, Coastal Zones, Gravity, Hydrology with valuable contributions to key climate change indicators, operational services and stimulating new applications leading to societal benefits at global and regional scale

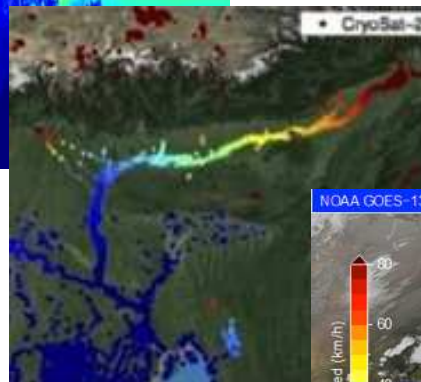


Surges  
Tsunami

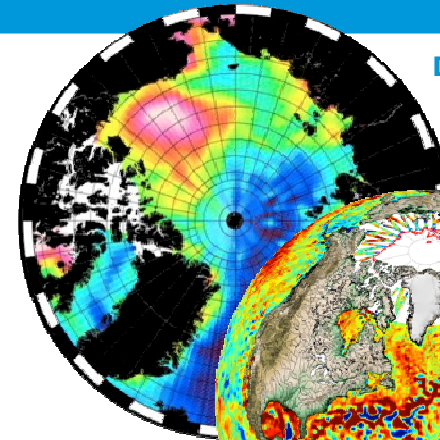
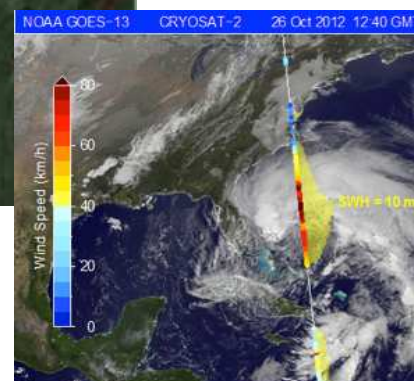
Coastal Zones



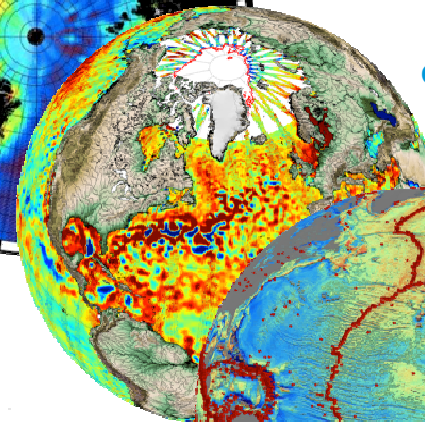
River & Lakes



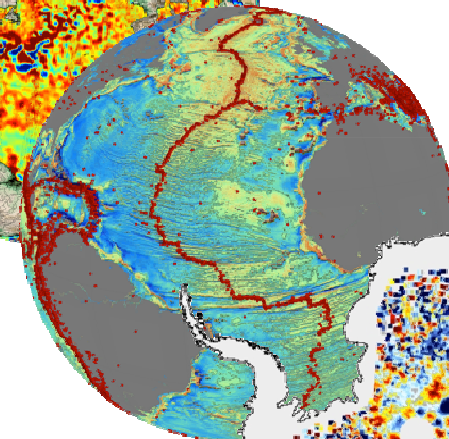
Wind Speed



Dynamic Topography



Ocean Currents

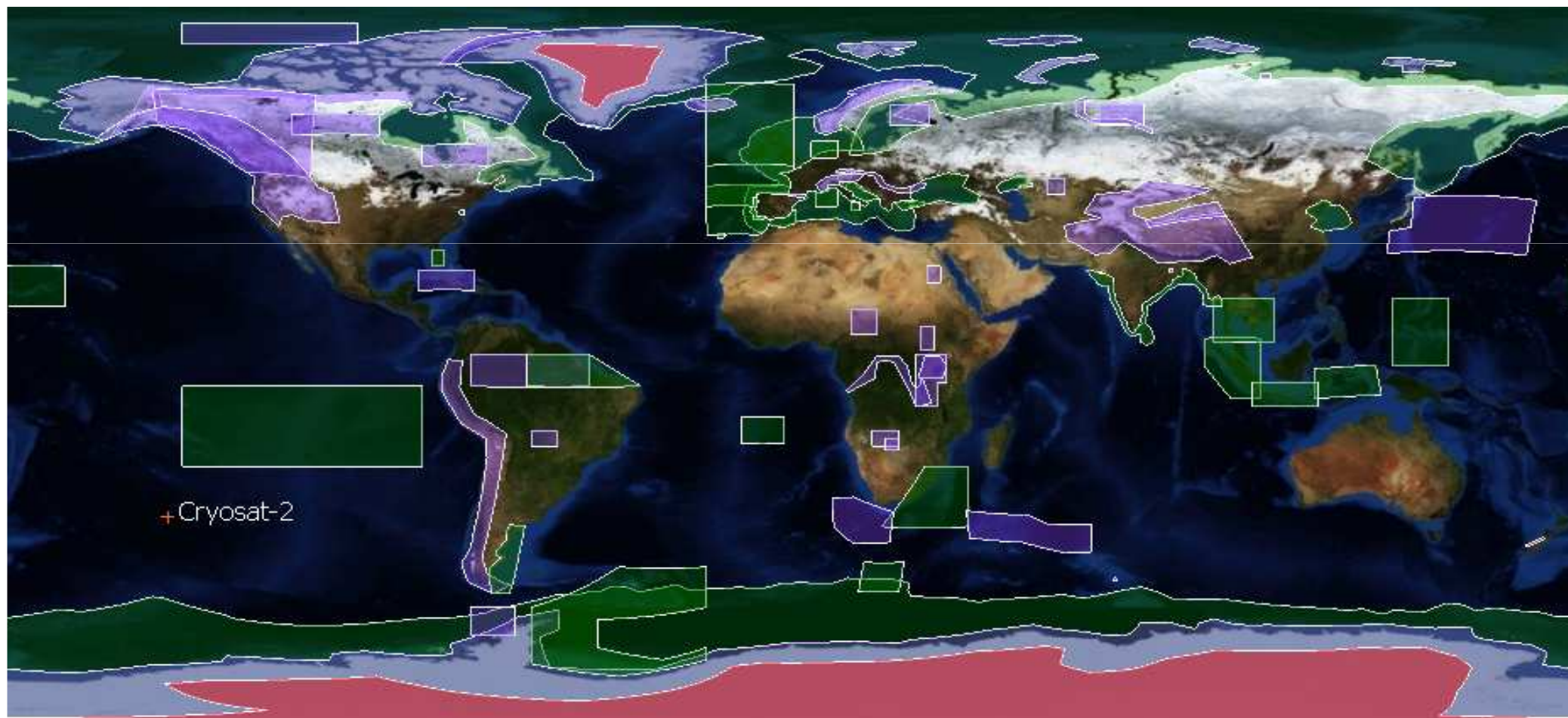


Bathymetry  
Gravity

Surface EM  
interaction

# CryoSat Mode Mask

**Next mode mask change in November upon user requests**





# GOCE

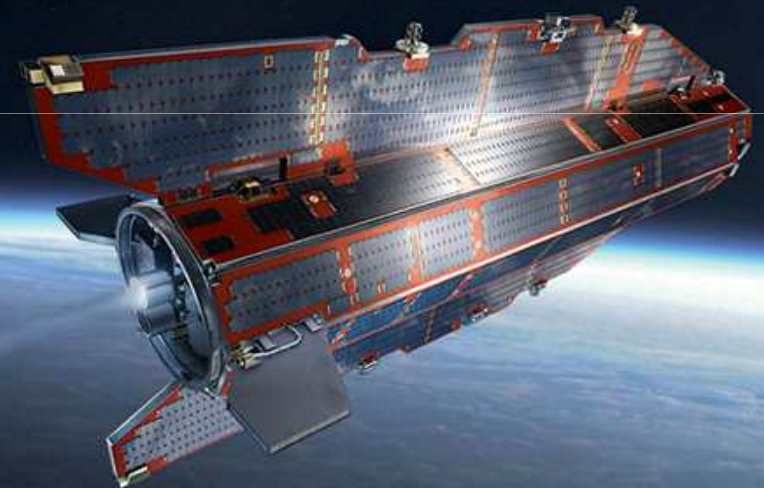


## → 5th INTERNATIONAL GOCE USER WORKSHOP

25–28 November 2014 | UNESCO | Paris, France



[earth.esa.int/goce](http://earth.esa.int/goce)



European Space Agency

Proceedings available... (ask me!)

[www.goce2014.org](http://www.goce2014.org)

- No major anomalies have impacted the availability of SMOS science data in the past months. Due to the implemented mitigation strategies, the performance of the instrument continues to be excellent, accounting for **99.05 % of availability** for generating observation data.
- Discussions on how to address the ESAC scientific recommendations provided as part of the **SMOS extension review** as well as their implementation are on-going.
- The reprocessing for level 2 soil moisture and ocean salinity is on-going, with a data release planned for end 2015.
  - The release of the new soil moisture in NRT product is planned for 11/2015.
- Preliminary results from the RFI tests over Japan indicate that the main contributors to the extended interference observed in Japan are the malfunctioning TV-Direct Broadcast systems.



# **The Copernicus Sentinel-3 Mission: Getting Ready for Launch and Operations**



European Space Agency

# Sentinel-3A Status



## Platform readiness

- ❑ Sentinel-3A AIT progressing: Full satellite (including OLCI) integrated since early July 2014
- ❑ Mechanical and Thermal Test Campaigns successfully completed respectively by end 2014 and Q2 2015
- ❑ Alert on one component in SLSTR and MWR instruments which required preventive repair; completed for both SLSTR and MWR.

## Payload readiness

- ❑ **SRAL** PFM instrument integrated on Satellite and tests complete.
- ❑ **MWR** PFM integrated on Sentinel-3A satellite.
- ❑ **SLSTR** FM2 integration into satellite completed after swap with un-calibrated PFM model.
- ❑ **OLCI** PFM re-integrated on Satellite after replacement of all OLCI-A cameras with those produced for OLCI-B (preventive measure following detection of a defective camera in Oct 2014 and risk of general issue not to be excluded)

**Sentinel-3B** Assembly, Integration and Test on-going



# SENTINEL-3 STATUS MAIN MESSAGES

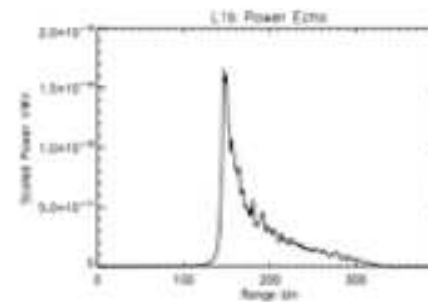
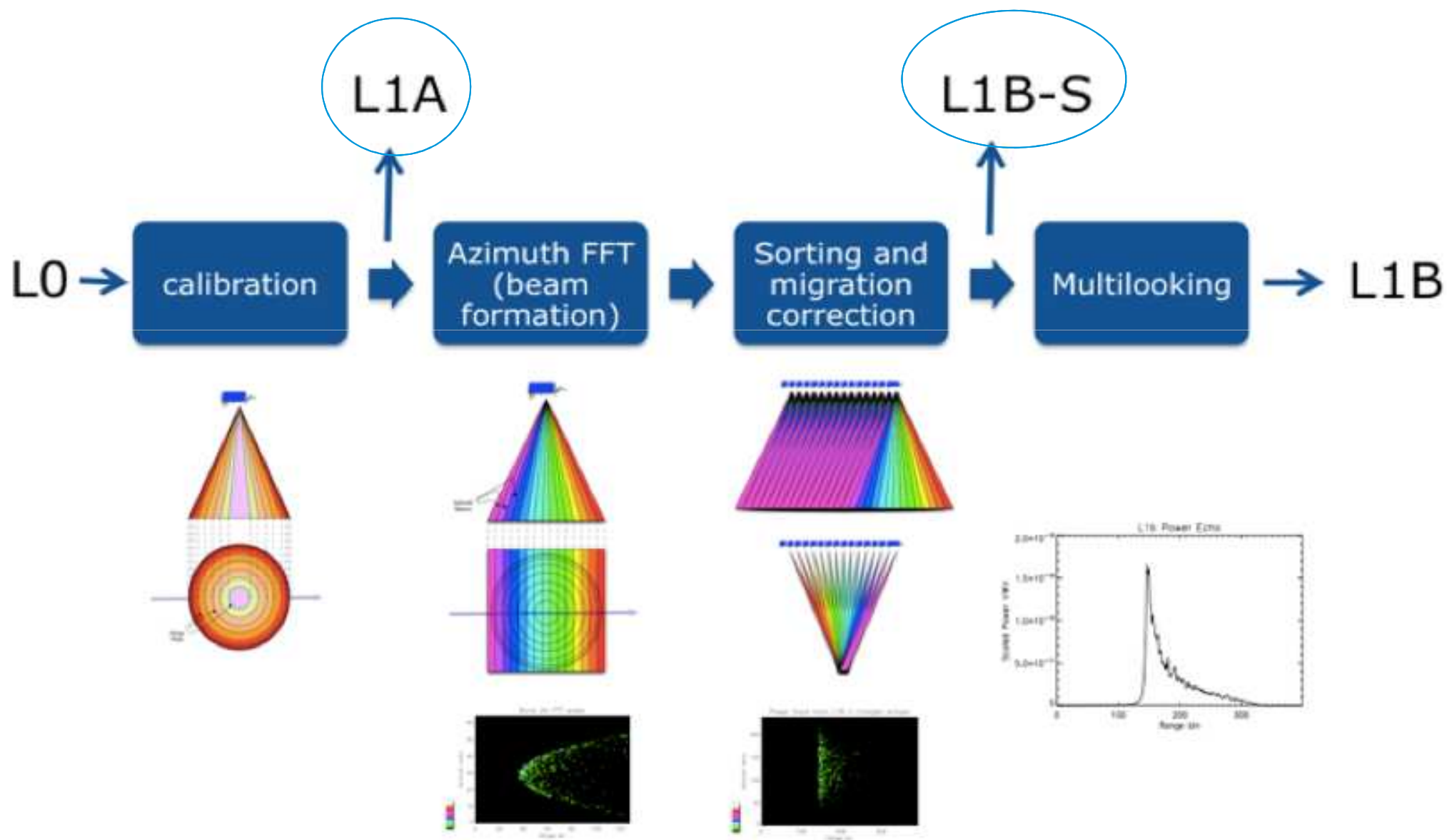


- ❑ Readiness of Sentinel-3A platform
- ❑ Launch window foreseen in December 2015
- ❑ All ground segment facilities supporting the S-3 operations are in place
- ❑ **S-3 will be the first mission to provide 100% SAR altimetry coverage!!**
- ❑ Preparation for commissioning phase being finalised.
- ❑ Mission Performance Centre for S-3 has been kick-off in October 2014
- ❑ Data access will follow same route as other Sentinels (S-1, S-2, S5P)
- ❑ Sentinel-3 for Science Workshop took place in June 2015 in Venice



272 papers  
from 35 countries,  
>1000 co-authors,  
290 Participants

# SENTINEL-3: Provision of additional L1 data





See

## **IPM\_002** - SENTINEL-3 STM Products & Processing Algorithms Definition

Femenias Pierre (ESA), Carla Santella (ESA), Alessandra Buongiorno (ESA), Hans Bonekamp (Eumetsat), Remko Scharroo (Eumetsat), Carolina Loddó Nogueira (Eumetsat)

## **ERR\_001** - Sentinel-3 Delay Doppler Altimeter: a New Insight on High Resolution Ocean Dynamics

Sylvie Labroue (CLS), Matthias Raynal (CLS), Thomas Moreau (CLS), Jean Christophe Poisson (CLS), Laiba Amarouche (CLS), Gérald Dibarboure (CLS), François Boy (CNES), Nicolas Picot (CNES)

## **Outreach: 16:30** - SAR altimetry processing on demand service for Cryosat-2 and Sentinel-3 at ESA G-POD

Salvatore Dinardo (SERCO/ESRIN), Jerome Benveniste (ESA/ESRIN)



# S3 Mission performance Center



S3 MPC is formed by 2 entities:-

## 1 - The MPC Coordinating Center

- Run and maintain the operational centre
- Undertake all the QC operations
- Ensures the overall Service performance (measured by KPIs)

## 2 - The ESLs (Expert Support Laboratories) activities

- Verification of the operational processing baseline
- Cal/Val activities



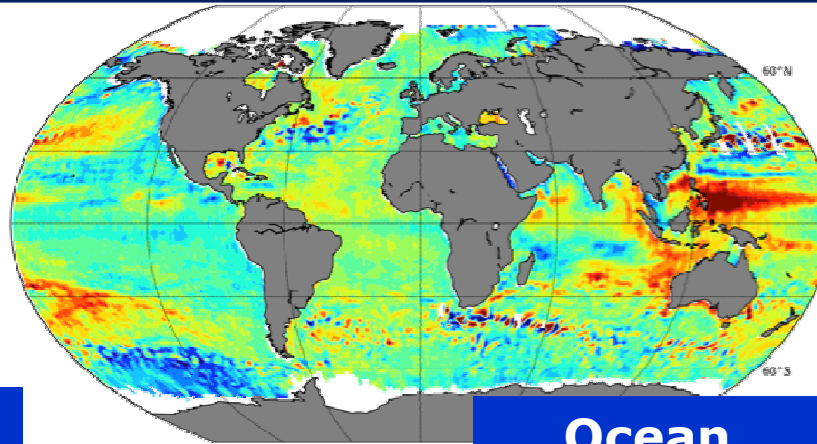
Mission  
Performance  
Centre

# STM MPC Ca/Val Activities

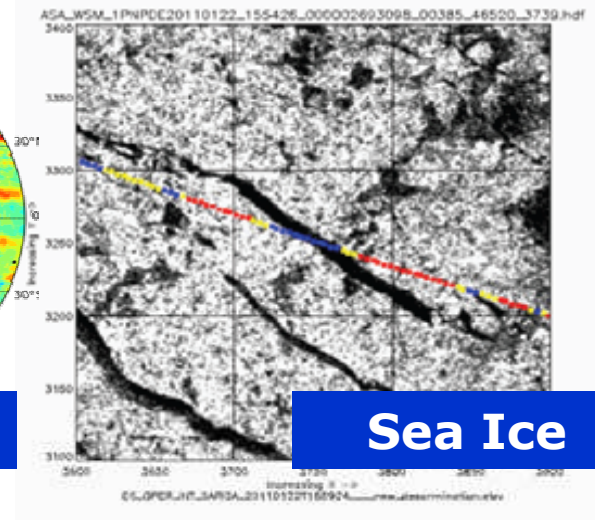
MPC in charge of the validation of the products and sensor performances over the different surfaces



**Coastal**

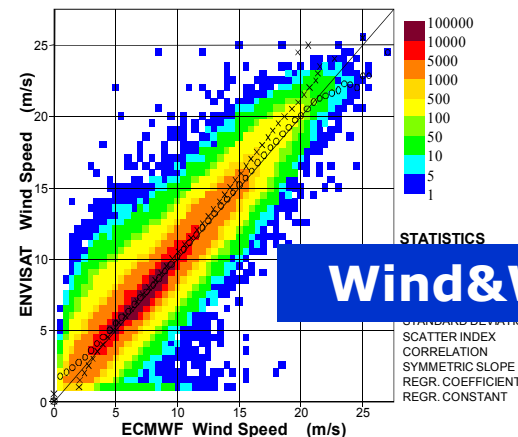
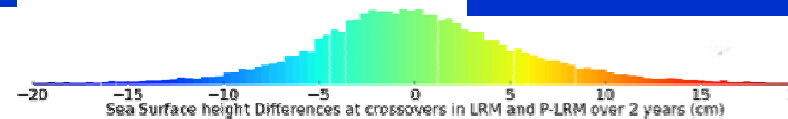


**Ocean**



**Sea Ice**

**River&Lake**

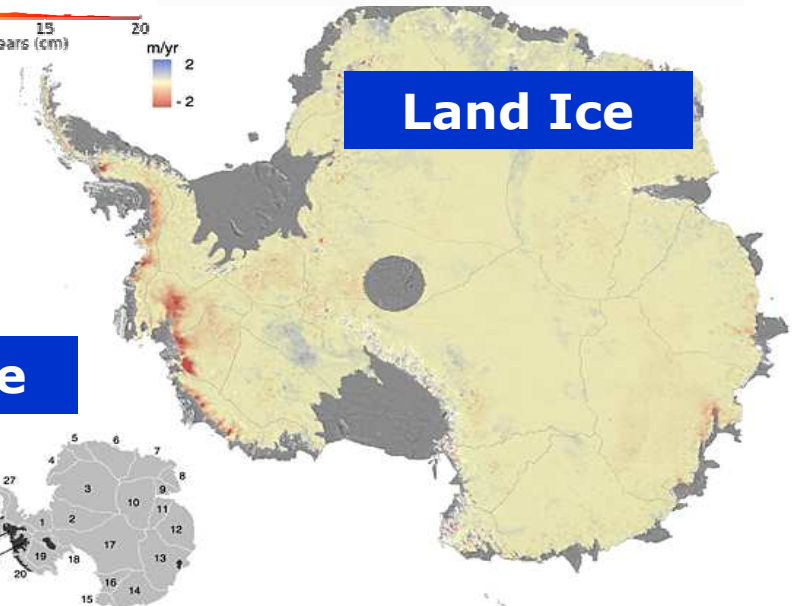


**Wind&Wave**

STATISTICS

SCATTER INDEX  
CORRELATION  
SYMMETRIC SLOPE  
REGR. COEFFICIENT  
REGR. CONSTANT

0.143  
0.946  
1.033  
0.959  
0.60725



**Land Ice**

# The STM MPC Team



Mission

ESL coordination

isardSAT®



PML | Plymouth Marine Laboratory



PML | Plymouth Marine Laboratory

Responsible for the overall STM Service



ThalesAlenia  
Space  
A Thales / Finmeccanica Company



Observatoire  
de la COTE d'AZUR

Expert Advisors for MWR, SRAL, In-situ



# The STM MPC Team



**SRAL Calibration  
Transponder Calibration**

**Wind&Wave Validation**

**Coastal Validation**



**PML** | Plymouth Marine Laboratory

**isardSAT**

**Ice sheet Validation  
River&Lake Validation  
Climate Validation**



**MWR Calibration  
Ocean Validation  
Marine match-up Database**



**PML** | Plymouth Marine Laboratory



**Ice sheet Validation  
Sea Ice Validation**



**SRAL Absolute Calibration**



# ESA and EUMETSAT share S3 operations

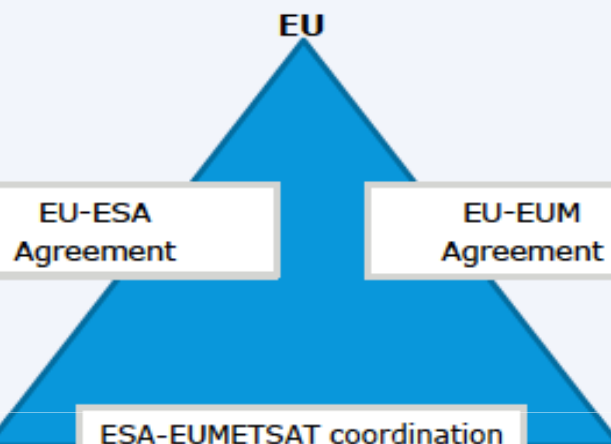


## LAND

Operations, maintenance and evolution of

- ❑ the Flight Operations Segment for LEOP and Commissioning phases
  - ❑ CSC shared multi-mission services (e.g. X-Band acquisition, POD)
  - ❑ the **Sentinel-3 Land Payload Data Ground Segment**
- and Post-Launch space segment support activities

ESA



## MARINE

Operations, maintenance and evolution of

- ❑ the Flight Operations Segment for routine phase, including mission planning, and
- ❑ EUMETSAT multi-mission (e.g. network) and specific facilities (e.g. processing, archiving, distribution) in support of the **Sentinel-3 Marine Payload Data Ground Segment**

EUMETSAT

# ESA: Sentinel-3 Data Access



*[sentinels.copernicus.eu](http://sentinels.copernicus.eu)*

## For ESA:

- ☐ Data access system in operations since October 2014
- ☐ Open and free Sentinel-3 data access will follow same principle as for other Sentinels (e.g. S-1, S-2, S-5 Precursor), with different access routes depending on user typology
- ☐ **Sentinel Open Access Data Hub (simple online self registration)**
  - ☐ Dedicated access for Copernicus Core services
  - ☐ Dedicated access to Member States Collaborative Ground segment
  - ☐ Dedicated access to International Agreements

# TRAINING

**Open source scientific toolboxes  
3000 + users in 70 countries**

## Sentinel 1/2/3 Toolboxes

- Multi-mission Scientific Toolboxes
- Developed as open source software
- Common architecture
- Portable to a Cloud infrastructure

**Download** <https://sentinels.copernicus.eu>

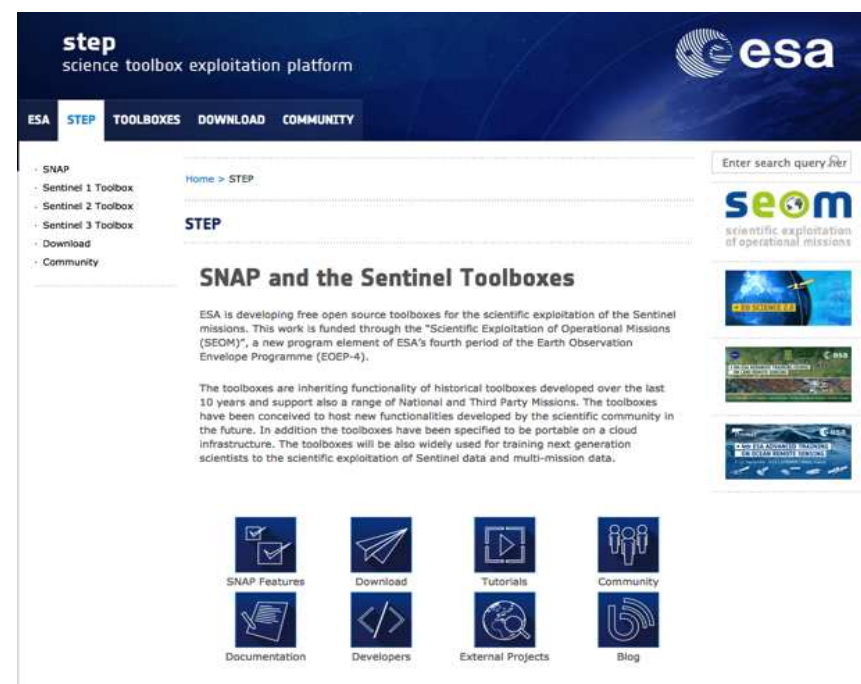


*Sentinel-1A First Mosaics Post-Processing with S1TBX*

## STEP (Science Toolbox Exploitation Platform)

- ◆ EO science collaborative platform
- ◆ Technical forum and community animation
- ◆ Gathering user feedback and usage
- ◆ Communicating on results
- ◆ Cloud demonstrator (e.g. Land Training 2015)

**Under preparation at** <http://step.esa.int/>





# Radar Altimetry Tutorial and Toolbox



Radarmetry Tutorial and Toolbox

www.altimetry.info

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**POSTER !**

[www.altimetry.info](http://www.altimetry.info)

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A banner for a training event. The background is a blue ocean with white-capped waves. In the top left, the 'Ifremer' logo is partially visible. In the top right, the 'esa' logo is partially visible. The central text is in white on a dark blue background. At the bottom, there are several white, 3D-rendered satellite models floating on the water.

Ifremer

esa

→ **4th ESA ADVANCED TRAINING  
ON OCEAN REMOTE SENSING**

7–11 September 2015 | IFREMER | Brest, France