ESA Earth Observation Programme and Missions Status

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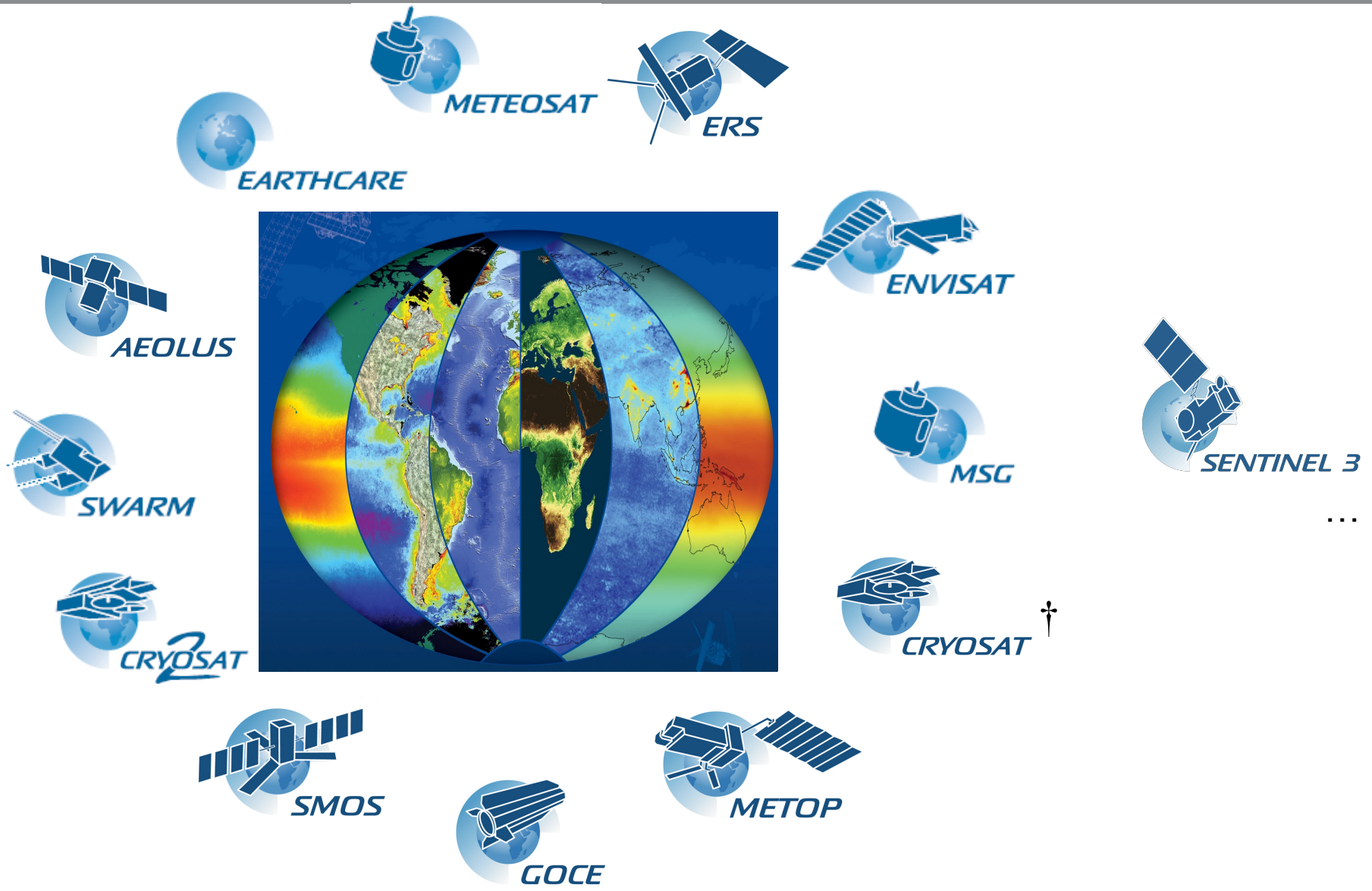
Earth Observation Science, Applications and Future Technologies Department

OSTST, Oct 2011, San Diego

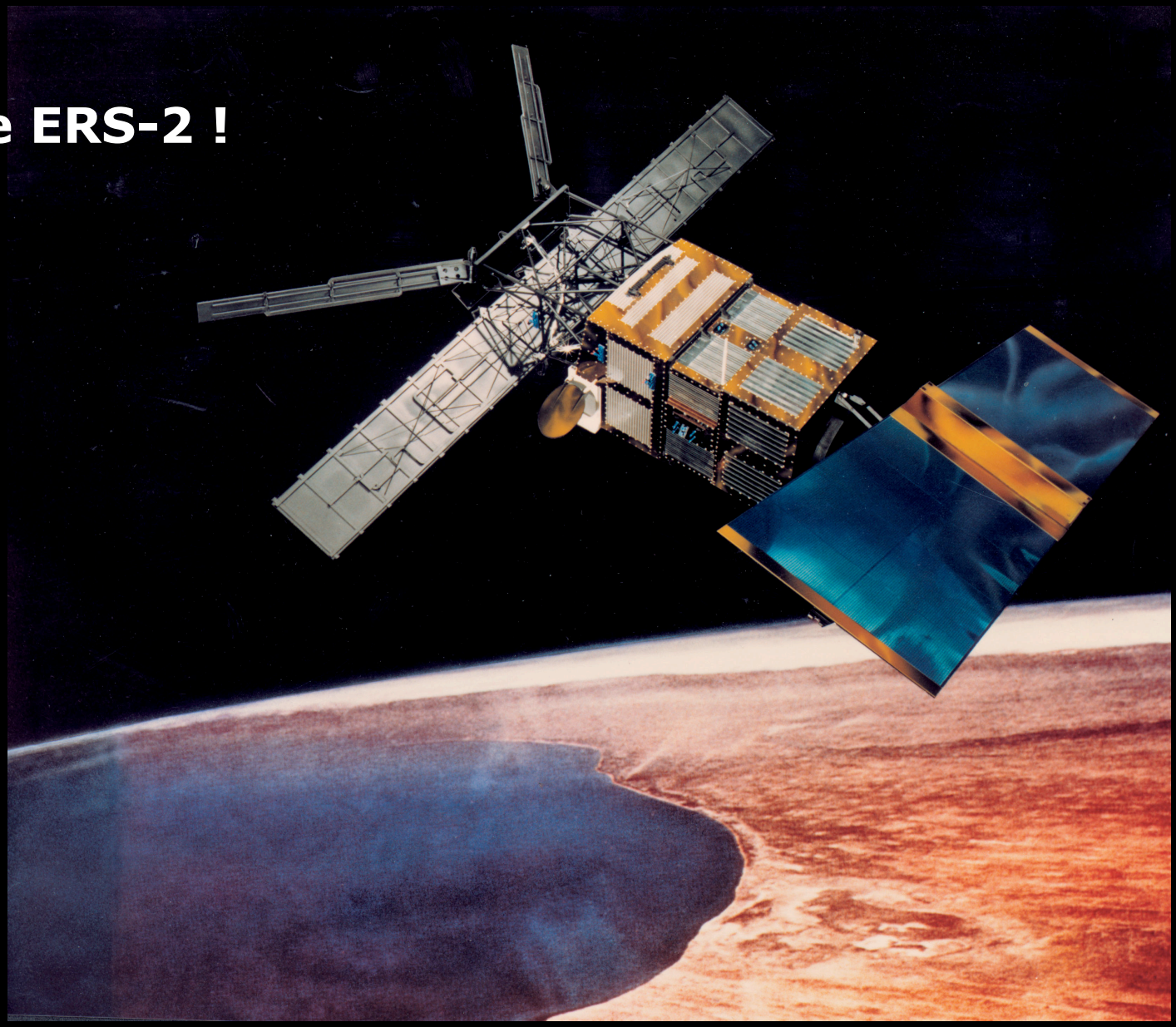
ESA's Earth Observation Toolkit



Focus on .....

+ Radar Altimetry Studies
+ ESA Climate Change Initiative
  -> Sea Level ECV

Bye Bye ERS-2 !

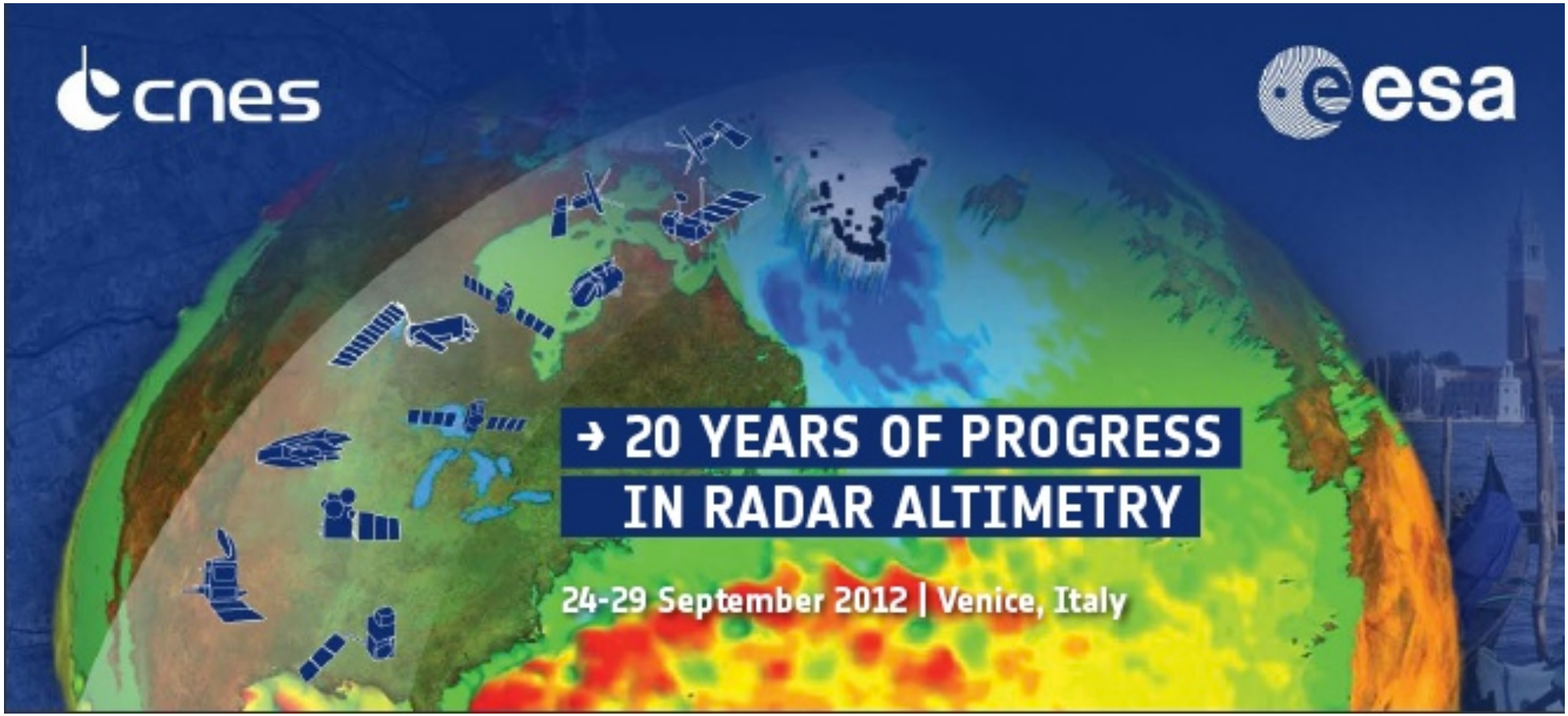


Bye Bye ERS-2 !

- After 16 years of successful operations, and a highly satisfactory scientific and applications output, the ERS-2 satellite was successfully de-orbited during summer 2011 with the final passivation on 5 September 2011.
- ERS-2 is now flying in a circular orbit at about 570 km altitude;
  - its re-entry into the atmosphere, where it will burn, will take between 15 and 20 years depending on the solar activity
  - i.e. well within the 25 years limit requested in the Inter-Agency Space Debris Mitigation Guidelines).
- The ERS-2 satellite acquired data until 4 July 2011, with its last months of activity dedicated to a specific Ice Phase (3-day repeat orbit).
- The "20 years ERS mission" was celebrated during the September PB-EO meeting at ESA-ESRIN together with the people having contributed to the success of the ERS missions.
- Outstanding return for science, industry and services of the original investments decided some 30 years ago.

Bye Bye ERS-2 !

- The myriad of scientific results of the ERS Radar Altimetry and TOPEX/Poseidon missions, and their follow-ons, will be celebrated in September 2012 at the Symposium:



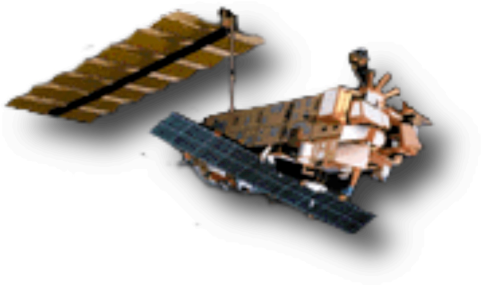
Bye Bye ERS-2 !

- Along with this symposium, several related events will take place on the same week, including
  - the annual meeting of the **OSTST** and
  - the International Doris Service (IDS)workshop,
  - as well as other thematic workshops

Envisat Status and Performance

Envisat Status and Performance

- The Envisat Service Module, the Payload Equipment Bay and the Payload operate with excellent availability.
- Top quality data are delivered by all instruments
- Altimetry products (Envisat + ERS)
  - The Envisat Altimetry Level 2 dataset (V2.1) reprocessing should be completed by end 2011, as per initial plans.
  - The ERS Altimetry dataset reprocessing (July 1991 to June 2003) will be initiated following the delivery of the Altimetry reprocessing chain (REAPER) further delayed to end 2011.
  - The ERS reprocessed orbit (REAPER) were used in the Sea Level Climate Change Initiative and their positive impact demonstrated.



GOCE Satellite Status and Performance

esa

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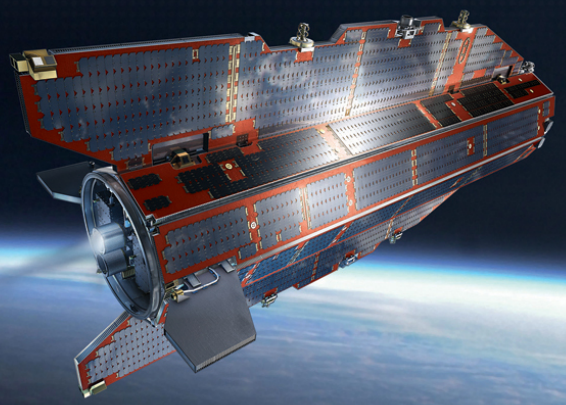
→ 4th INTERNATIONAL GOCE USER WORKSHOP

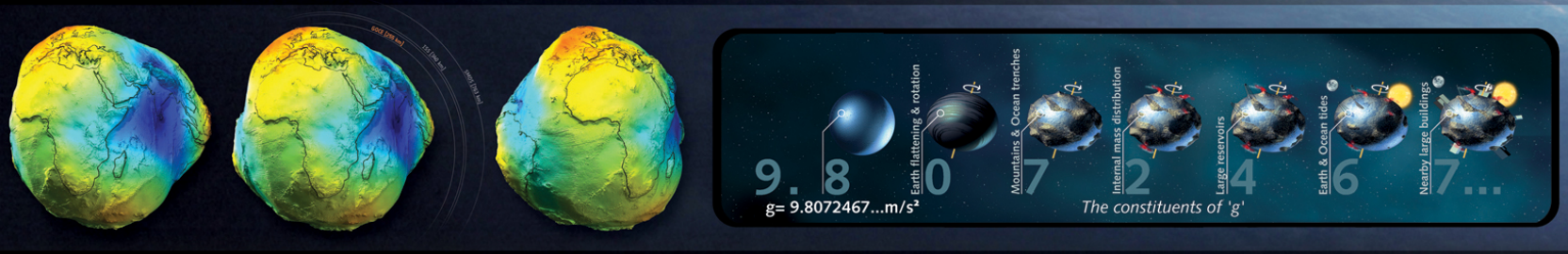
31 March - 1 April 2011
Technische Universität München (TUM)
Munich, Germany



IAS TUM Institute for Advanced Study

TUM

www.goce2011.org

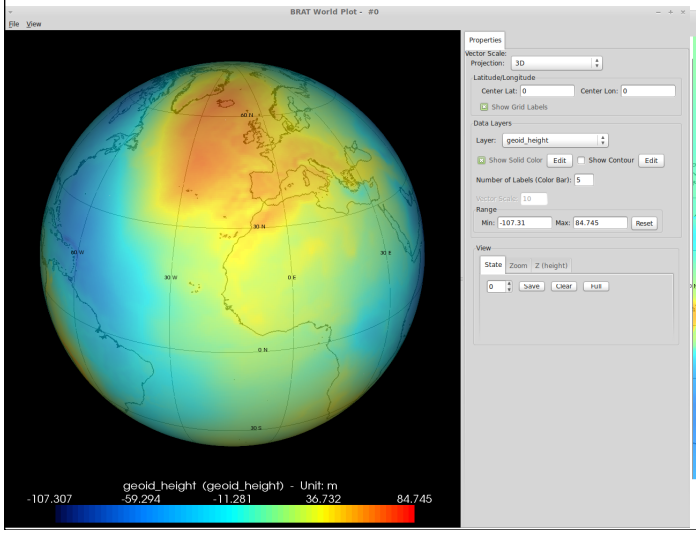


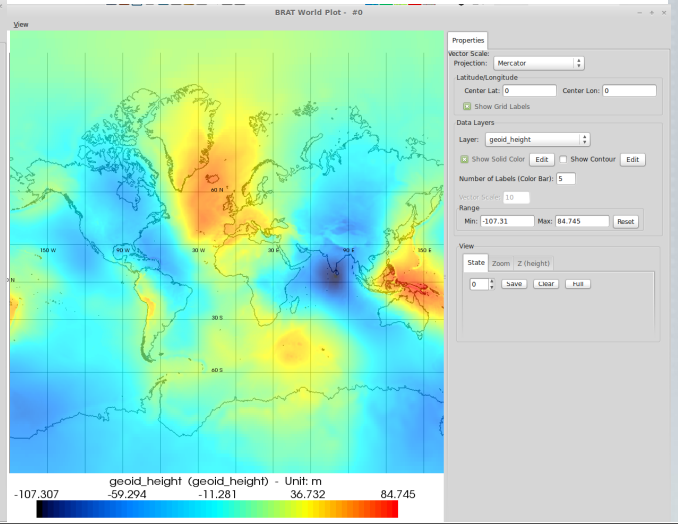
www.esa.int

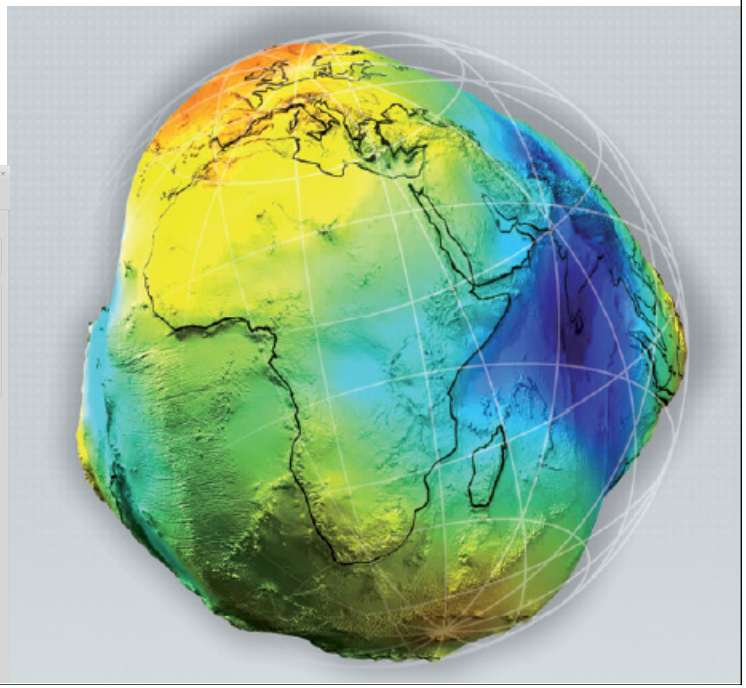
European Space Agency

GOCE Satellite Status and Performance

- GOCE has continued to provide top-quality gravity field data, without issues of any kind (i.e. at 100% data acquisition, 100% processed up to Level 1b).
- These gapless data streams are strong indicators of the high quality and robustness of the instruments and of the science data processing systems.
- GOCE User Workshop was held in Munich last March.
  - 30 Presentations, 60+ Posters, 176 Participants
  - Applications of GOCE data really take off
  - High level of interest from media







GOCE Satellite Status and Performance

- Measurement cycle number 10 was just completed.
- A routine gradiometer instrument calibration just took place (as is done at regular intervals between subsequent 61-days repeat cycles).
- The atmospheric drag has been stable for the major part of the summer but solar activity has increased significantly throughout September. Still there is no indication that an orbit raise due to increased drag would be necessary in the near future.
- A significant update of the Level 1b instrument processing facility has been installed towards the end of August.
    - Based on experience gained from the first two years of GOCE in-flight data analysis, the new products improves the gravity gradient product at the lower end of the measurement band and below.
    - It is also significantly faster than the previous processor.
    - Re-processing is underway and the complete nominal mission is expected to be available in January 2012.
- The third generation of GOCE-based gravity field models is under preparation.

GOCE User Toolbox

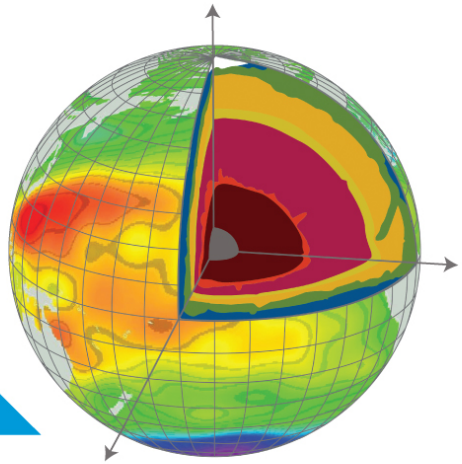
GOCE User Toolbox

- Version 2.1 of the GOCE User Toolbox (GUT) was released in July 2011.
- Since its release, the GUT website has provided over 115 unique downloads and in the order of 10 unique visits per day.
- The toolbox software project is now in its maintenance phase.
- Further enhancements of the toolbox and the related programmatic setup are under discussion.

http://earth.esa.int/gut/

gut

GOCE USER TOOLBOX

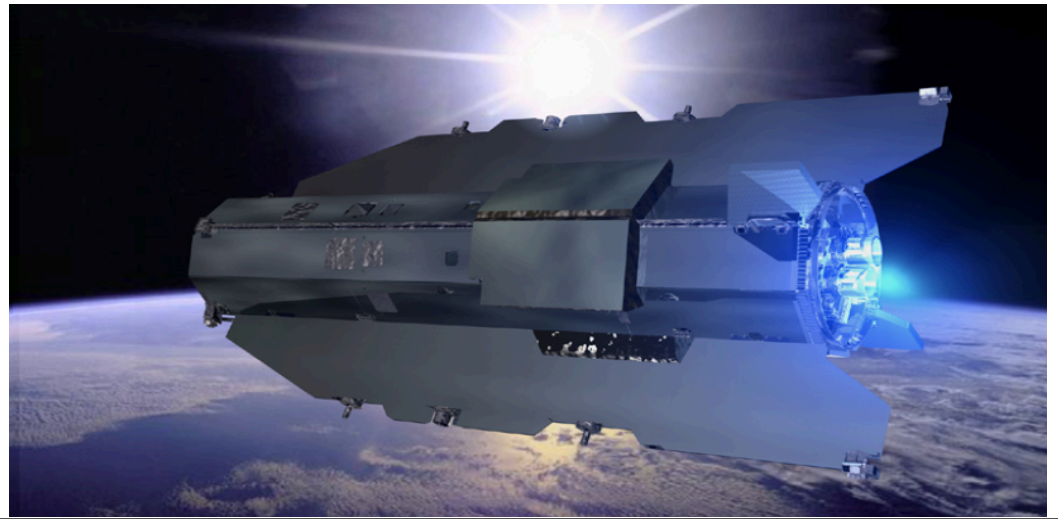


GOCE Mission Concept and Outlook

- Continuation of continuous gravity field mapping only interrupted by infrequent calibrations (approximately one day of satellite shaking every two months).
- Release 3 of GOCE gravity field model(s) in November 2011.
- Reprocessing of Level 1b and Level 2 data as from July/August 2011 to be completed by January 2012.
- Release 4 of GOCE gravity field model(s) – based on reprocessed Level 1bdata – in autumn 2012.

GOCE Mission Concept and Outlook

- With the present solar activity forecasts it is expected that science operations can be continued during long eclipses period.
- The concept of six months long Measurement Operations Phases is therefore obsolete.
- The operational altitude will be reassessed according to the evolution of the solar activity, however it is highly likely that GOCE will be able to maintain its current altitude until April 2012.



GOCE DATA ACCESS

- Data available from EO User Services (by ordering) and for direct download from the "cloud" through a virtual on-line archive

  http://eo-virtual-archive1.esa.int/Index.html

  http://earth.esa.int/GOCE/

GOCE RESULTS

- See Talks:
  - **Richard Biancale**: EIGEN-6 - The new combined global gravity field model including GOCE data from the collaboration of GFZ Potsdam and GRGS Toulouse
  - **Marie-Helene Rio**: High resolution Mean Dynamic Topography in the Kerguelen area from altimetry, GOCE data and oceanographic in-situ measurements
  - **Roman Savcenko**: The challenge of GOCE and multi-mission altimetry: instantaneous dynamic ocean topography profiles with meso-scale resolution
- See Posters:
  - **Alexander Horvath**: Validation of CryoSat-2 Classical Altimetry Data over Ocean using a GOCE Geoid to compute Absolute Dynamic Topography
  - **Per Knudsen**: A global Mean Dynamic Topography and Ocean Circulation Estimation using a Preliminary GOCE Gravity Model
  - **Sandrine Mulet**: How accurate are the recent geoid models based on GOCE and GRACE data for oceanographic applications?
  - **Bruno Manuel Lucas**: The GOCE User Toolbox: Geodesy, Oceanography and Solid Earth in One Software Suite

CryoSat

CryoSat

- Status Report by Duncan Wingham, CryoSat Lead Scientist

CryoSat

- See Talks:
  - **Christine Gommenginger**: Improved altimetric accuracy of SAR altimeters over the ocean: observational evidence from Cryosat-2 SAR and Jason-2
  - **Laurent Phalippou**: Optimal re-tracking of SAR altimeter echoes over open ocean: from theory to results for SIRAL2
  - **Walter Smith**: Retracking range, SWH, sigma-naught, and attitude in CryoSat conventional ocean data
  - **Natalia Galin**: Measurement of the across-track slope of the marine geiod with SAR - interferometric altimeter.
  - **Duncan Wingham**: Models of the echo from the ocean surface from the CryoSat-2 pulse-limited, SAR and SAR- interferometric altimeters.
  - **Katharine Giles**: Precision measurement of the ocean surface topography with the CryoSat-2 synthetic aperture altimeter
  - **François Boy**: Cryosat LRM, TRK and SAR processingPierre Thibaut: SAR Data over Ocean, Processing Strategy and Continuity with LRM Data
  - **Pierre Thibaut**: SAR Data over Ocean, Processing Strategy and Continuity with LRM Data
  - **Walter Smith**: Near-Real-Time Wave, Wind, and Sea Surface Height from CryoSat FDM/L1B data
  - **Duncan Wingham**: SAR and SARIN modes on CryoSat-2
  - **Richard Francis/ John Lillibridge**: CryoSat-2 Issues
  - **Remko Scharroo**: Validation of retracked CryoSat data over open oceans

- See Session:

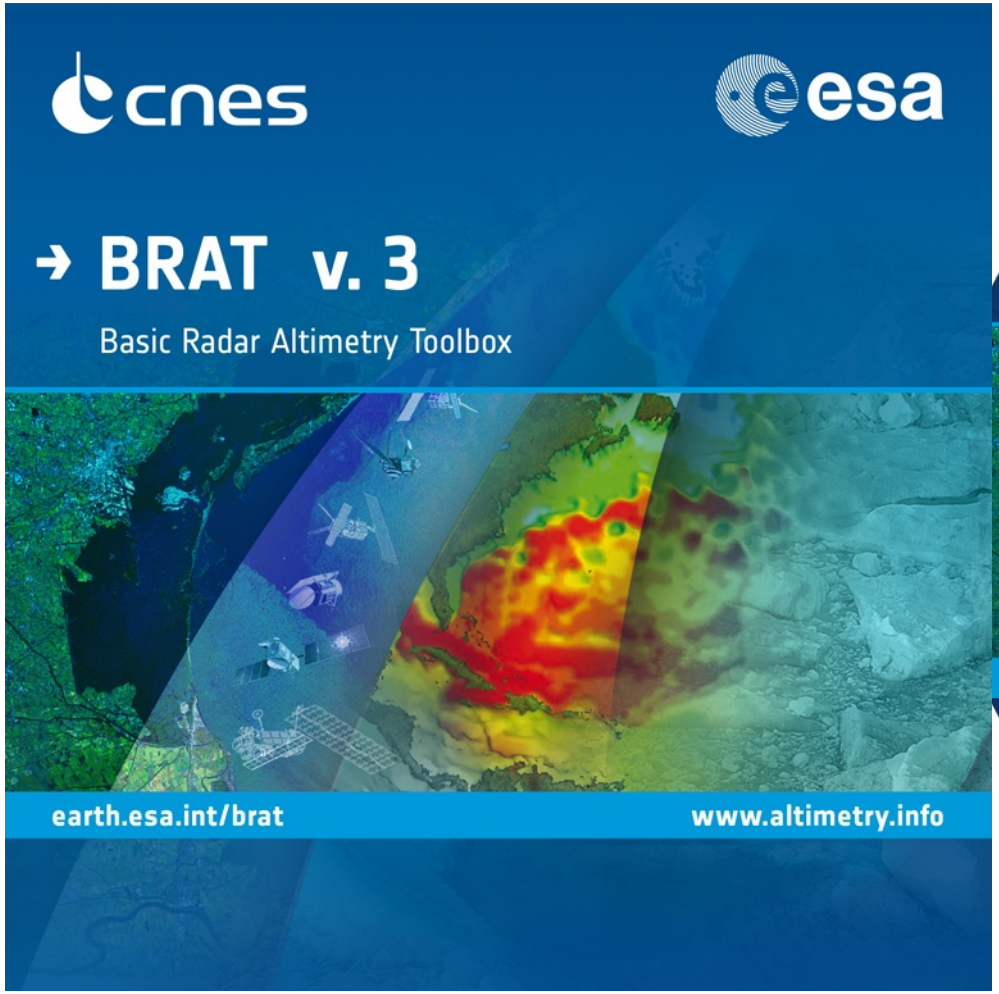
  - **Advanced Altimetry Modes (SAR/SARIN)**
    Walter Smith, Duncan Wingham, Richard Francis, Hans Bonekamp

CryoSat

- See Posters:
  - **Sylvie Labroue:** First quality assessment of the CRYOSAT-2 Altimetric System over Ocean
  - **Cristina Martin-Puig:** Analysis of SAR mode retrakers performances on Cryosat data
  - **Ole Baltazar Andersen**: First evaluation of CRYOSAT-2 data for MSS computation in the Arctic
  - **Alexander Horvath**: Validation of CryoSat-2 Classical Altimetry Data over Ocean using a GOCE Geoid to compute Absolute Dynamic Topography
  - **Gerald Dibarboure**: A Demonstration of the Potential of Cryosat-2 to Contribute to Mesoscale Observation
  - **Remko Scharoo**: RADS 4: A new interface to precise and fast-delivery altimeter data from Geosat to CryoSat
  - **Vinca Rosmorduc**: Basic Radar Altimetry Toolbox: tools to teach altimetry
  - **Salvatore Dinardo**: SAR Altimetry in Open and Coastal Sea Water: Performances, Limits, Perspectives
  - **Jérôme Benveniste**: Road-mapping the Way Forward for Sentinel-3 STM SAR-Mode Waveform Retracking Over Water Surfaces

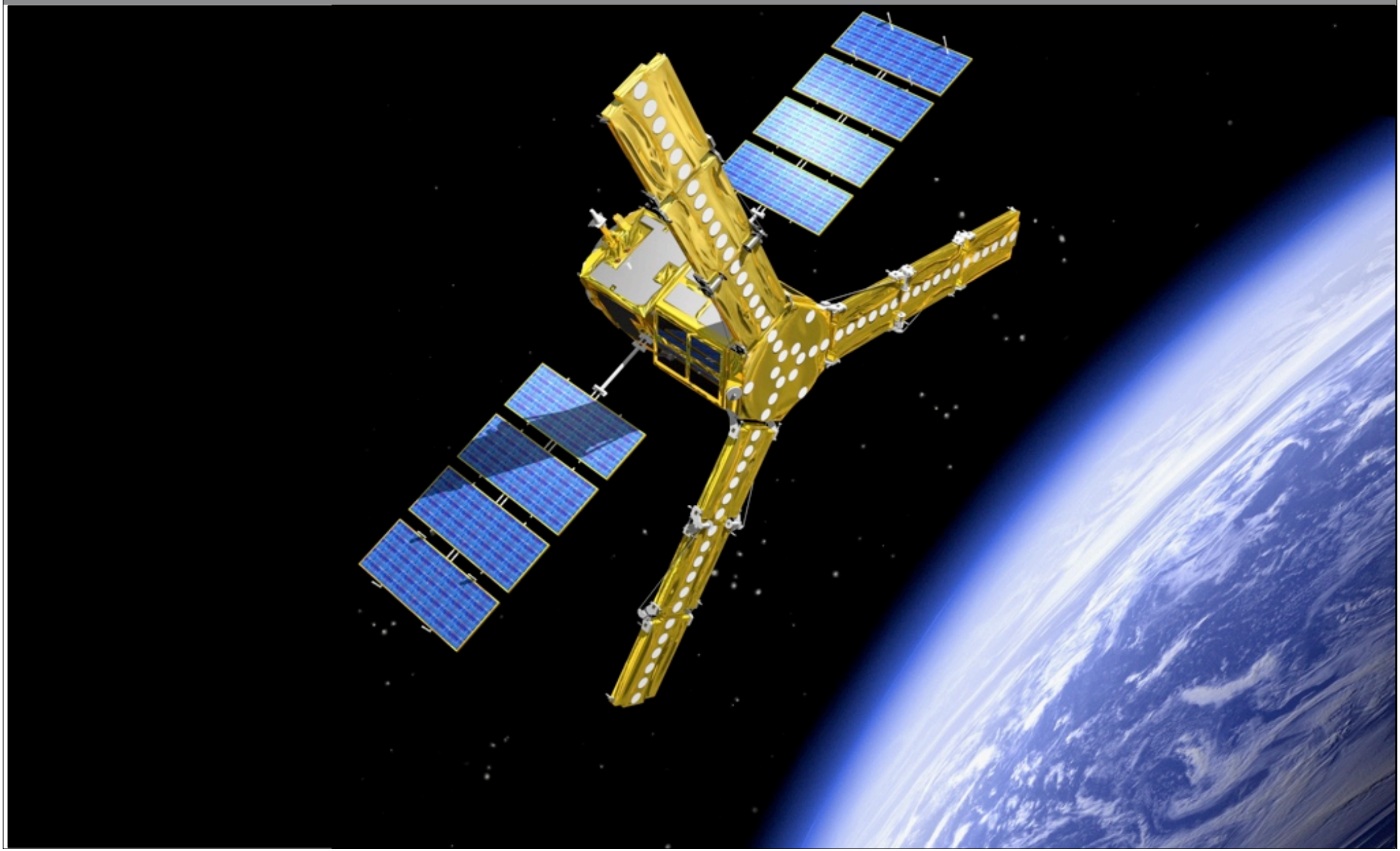
See the Proceedings...

BASIC RADAR ALTIMETRY TOOLBOX
RADAR ALTIMETRY TUTORIAL

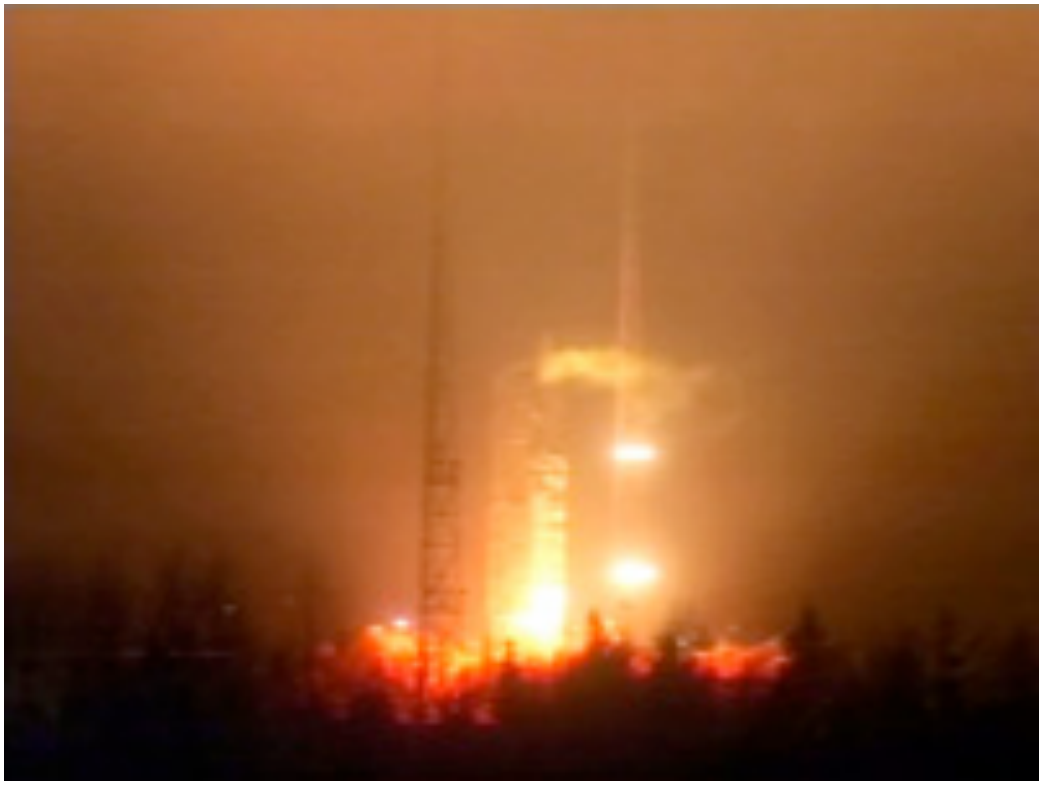


http://earth.esa.int/brat

SMOS - Ocean Salinity



SMOS - Ocean Salinity



Launch: 2 November 2009 from Plesetsk, Russia,

SMOS - Status

- The 1st reprocessing campaign, to take place in Q4 2011, is under preparation and ready to commence at the end of October. All reprocessed data, Level 1 and 2, should be available in February 2012.
- The French Centre Aval de Traitement des Données SMOS (CATDS) and the Spanish SMOS CP34 are now providing SMOS level 3 data products.
- Most of the improvements in the processors versions to be used for the reprocessing campaign have been achieved.
- No major anomalies have impacted the availability of SMOS science data in last 3 months, except for the Correlator and Control Unit (CCU) resets – alleviated by an on-board SW patch.
- The RFI situation in particular over Europe continues to improve. However, some very strong sources are still present.
- ESA and CNES have jointly organised a SMOS science workshop on 27-29 September 2011 in Arles, France. 100 abstracts submitted.
    - See the Proceedings...

SMOS - Where to Get Information

SMOS webpage
→earth.esa.int/smos

Information on

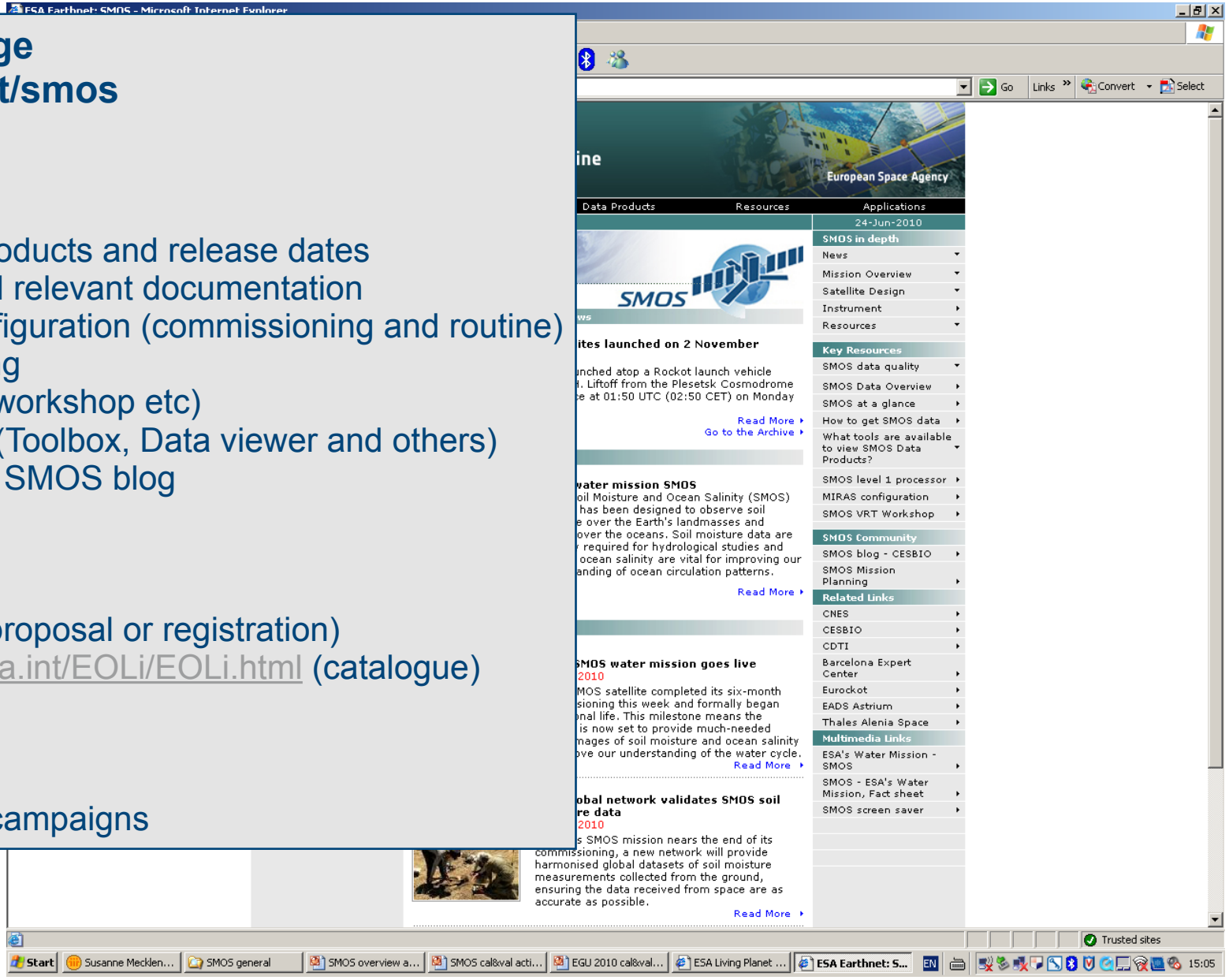
- Data quality, products and release dates
- Processors and relevant documentation
- Instrument configuration (commissioning and routine)
- Mission planning
- Events (SVRT workshop etc)
- Available tools (Toolbox, Data viewer and others)
- link to CESBIO SMOS blog

Data access

→ eopi.esa.int (proposal or registration)
→ http://earth.esa.int/EOLi/EOLi.html (catalogue)

Campaign data

→ earth.esa.int/campaigns



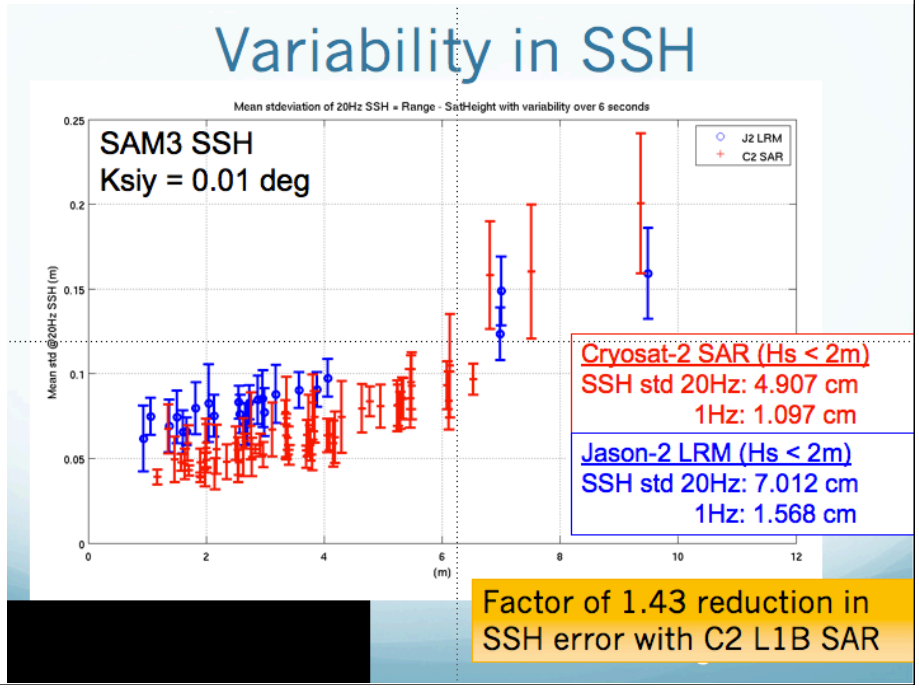
SENTINEL-3

- See talk on Friday: Sentinel-3 (Jérôme Benveniste)

RESEARCH PROJECTS

- SAMOSA
  - SAMOSA is a project to study oceanographic applications of Synthetic Aperture Radar (SAR) mode (or Delay Doppler mode) altimetry and develop new theoretical models for the SAR echo waveform retracking
  - Final review meeting took place on 19 May 201

- See talk:
  Christine Gommenginger: Improved altimetric accuracy of SAR altimeters over the ocean: observational evidence from Cryosat-2 SAR and Jason-2
- http://www.satoc.eu/projects/samosa/



RESEARCH PROJECTS

- COASTALT
  - Final review meeting took place on 20 June 2011
    - See **Paolo Cipollini**'s presentations:
  - Keynote Talk: Coastal Reflections: New Science and Open Questions from the Coastal Altimetry Workshop (Paolo Cipollini)
  - Paolo Cipollini: Processing of coastal altimetry data in the COASTALT Project
  - see http://www.coastalt.eu

RESEARCH PROJECTS

- CRYOSAT+ Ocean & Land/Inland Water
  - R&D Exploitation of CryoSat data
  - Open tender ; closing date 18 Nov 2011
  - see http://emits.esa.int

ESA Climate Change Initiative

Sea Level cci

CCI: phased programme

Sea Level CCI: 1st Annual Review (15/09/2011)

2000 pages of Algorithm Comparison Reports

http://www.esa-sealevel-cci.org/

Phase 1: (3 yr)
- **Scientific user consultation, algorithm dev/selection, detailed specifications**

Phase 2: (3 yr)
- **Operational Systems implementation, production**

Phase 3: (6 yr!)
- **User assessment, assimilation**

thank you…