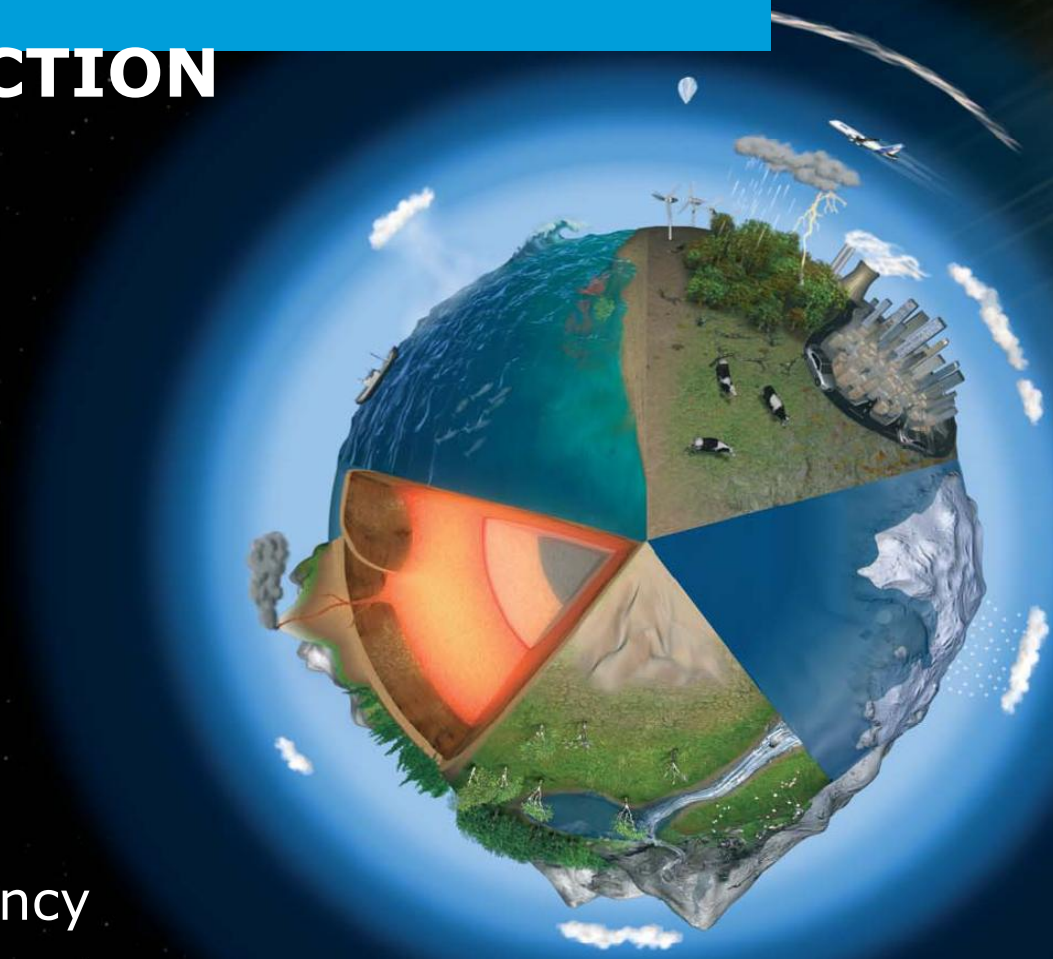
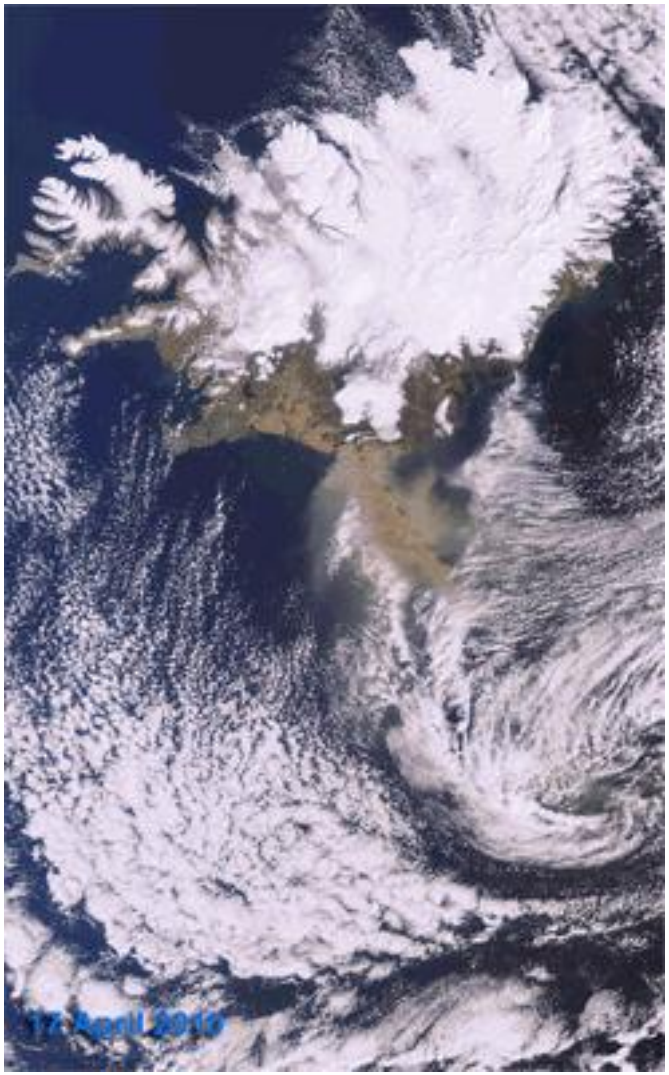
→WELCOME AND INTRODUCTION



Stephen Briggs

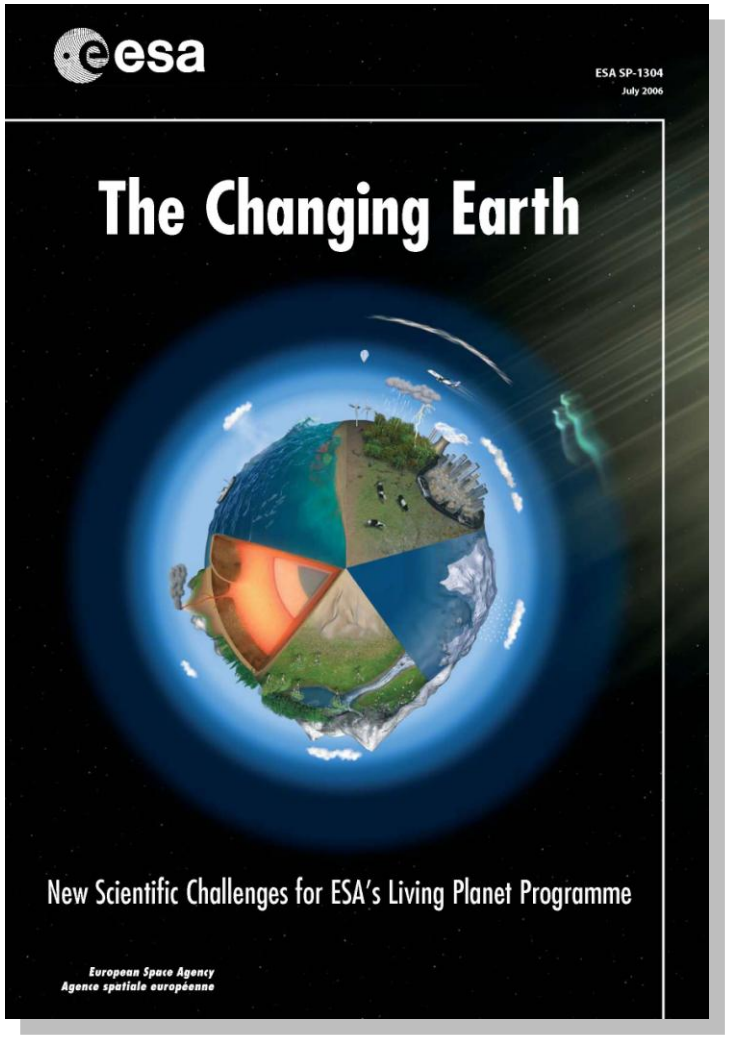
European Space Agency

WARM WELCOME FROM ESA



ENVISAT keeps an eye on Island's volcano – a unique place where the warm meets the cold

Scientific challenges for ESA's Living Planet Programme



- Updated Science Strategy for ESA's LPP, after broad user consultation
- SP-1304 identifies key scientific challenges for: hydrosphere, atmosphere, cryosphere, biosphere and geosphere
- Emphasis on the system approach, where interactions and interfaces between different parts of the Earth system are fundamental

ESA's Living Planet Programme

Earth Explorer

Research driven

Core Missions

GOCE
March 17th
2009

ADM-Aeolus

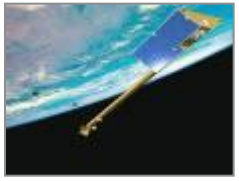
EarthCARE

Biomass/
CoReH2O
/Premier

Opportunity Missions

CryoSat 2
April 8th
2010

SMOS
November 2nd
2009



Swarm

Call for
proposals
for EE8

Earth Watch

Operational Service driven

Operational Meteorology

- Meteosat
- MSG
- EPS (MetOp)
- MTG
- Post EPS

GMES

- Sentinel 1
- Sentinel 2
- Sentinel 3
- Sentinel 4
- Sentinel 5 precursor
- Sentinel 5

GOCE - Gravity field and steady-state Ocean Circulation Explorer

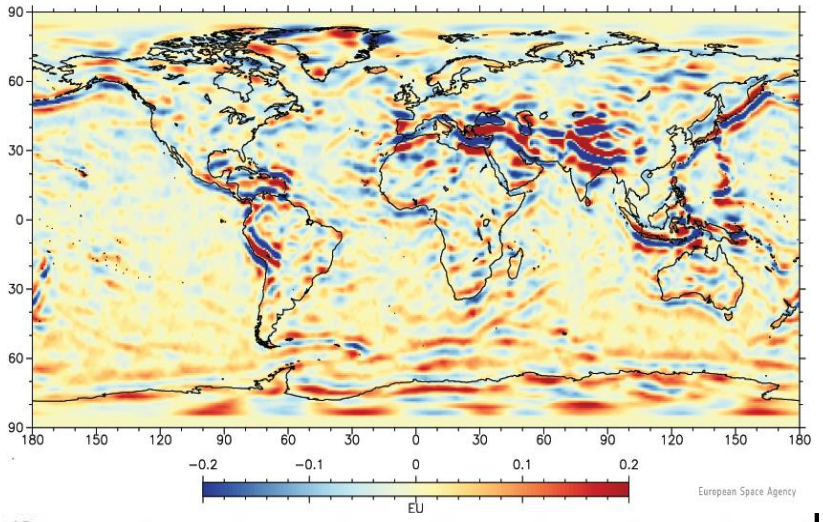
Objectives:

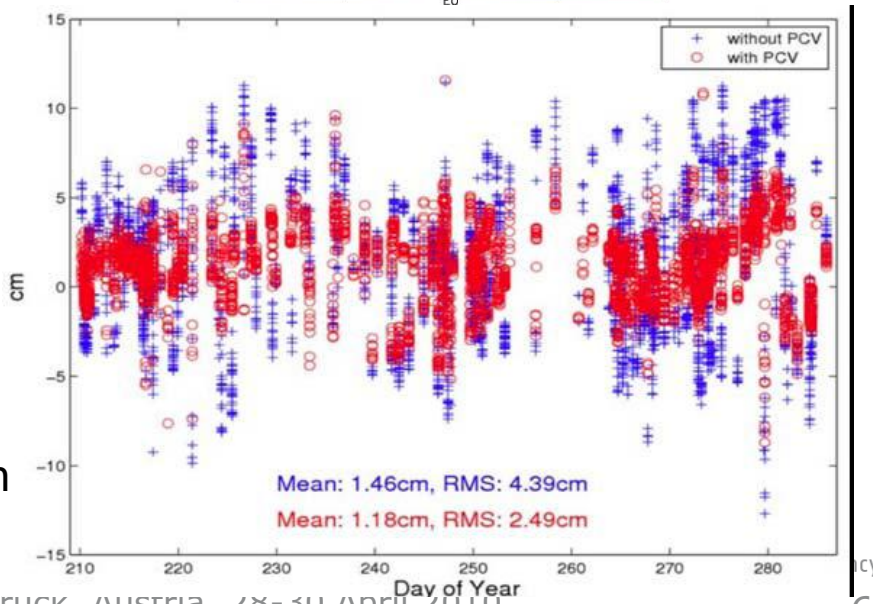
- global ocean circulation and transfer of heat
- physics of the Earth's interior (lithosphere & mantle)
- sea level records, topographic processes, evolution of ice sheets and sea level change

GOCE - status

- Launch: 17. March' 09
- Nominal science operations started on 29 Sept. '09
- First complete Earth mapping achieved on 26 Dec. '09
- Analysis of data quality indicates that all mission objectives can be met
- Official release of L2 product at Bergen Living Planet Symposium, Norway (28 June to 2 July)

Uzz





Top class orbits: current POD accuracy is at 1-2 cm level in each of the three orthogonal directions

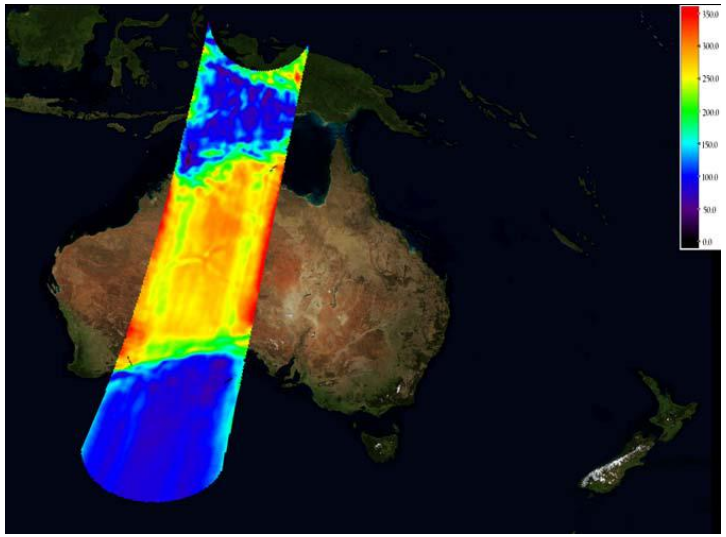
SMOS

Objectives:

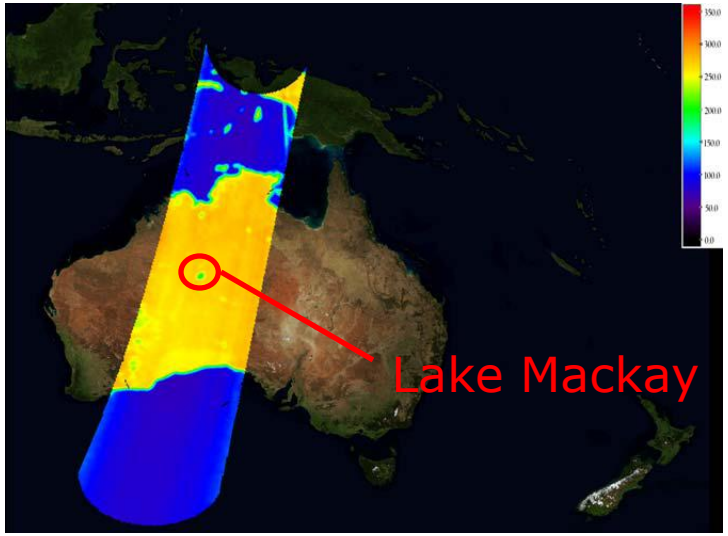
- Provide global maps of soil moisture and ocean salinity for hydrological studies
- Advance our understanding of the freshwater cycle
- Improve climate, weather and extreme event forecasting

SMOS - status

uncalibrated



calibrated



- Launch: 2 November `10
- Antenna deployment: 3. November
- Instrument switch-on: 17. November
- Present: Calibration of instrument and validation of data
- MIRAS instrument working flawlessly

Cryosat-2

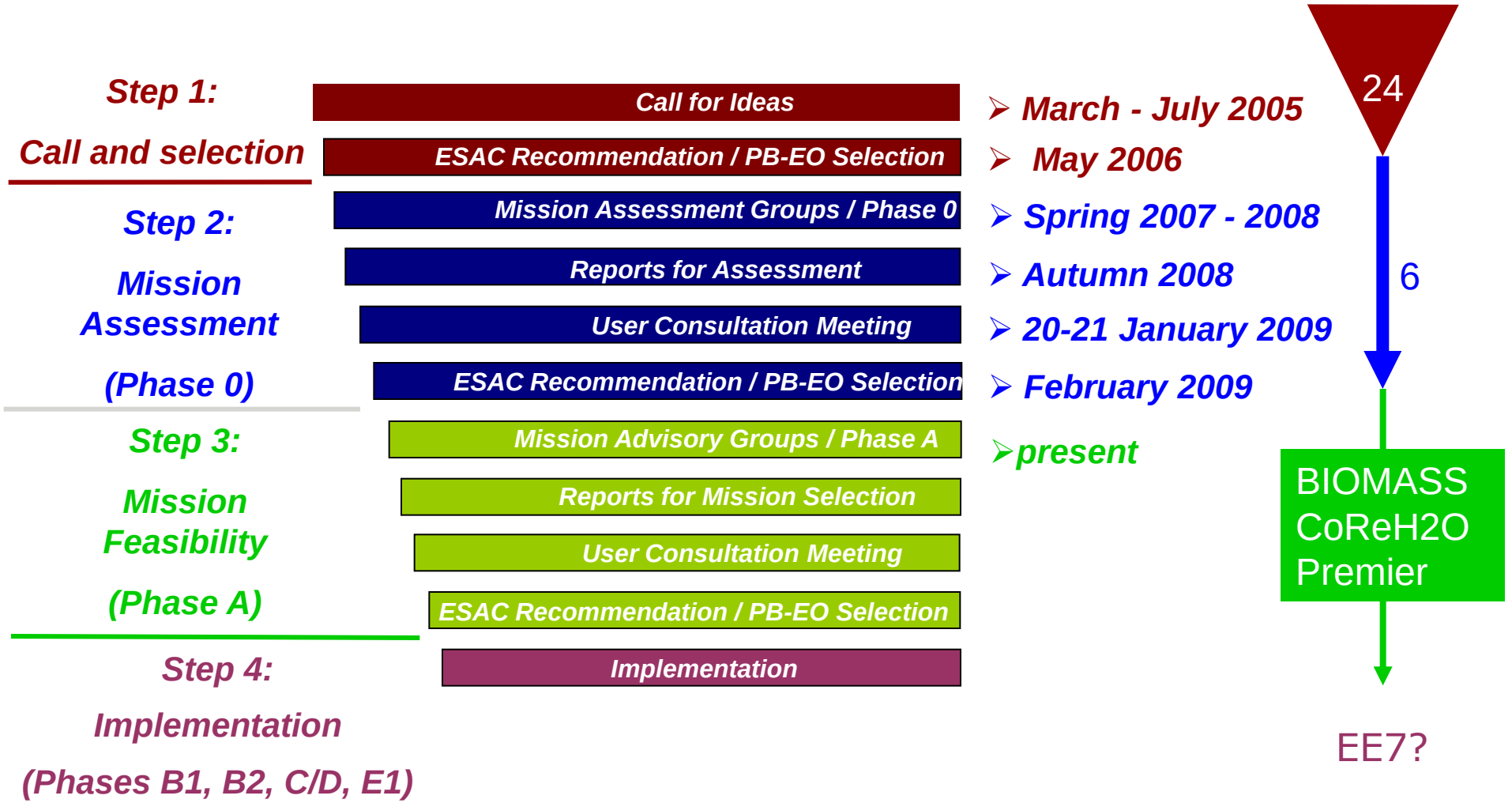
Objectives:

- Improve understanding of thickness and mass fluctuations of polar land and marine ice
- Quantify rates of thinning/thickening due to climate variations

Cryosat-2 - status

- Launched: 8. April ’10
- SIRAL switch-on: 11. April
- First internal calibration has proven that the hardware is fully functioning
- First mode transitions have been commanded
- PDGS is acquiring and processing all products automatically

Selection steps of the EE7



EE7 status

- Proposals for parallel phase A studies of all three candidates (Biomass, CoReH2O, Premier) evaluated and studies kicked off
- Two parallel System Studies per mission by competing industrial consortia, with increased resources w.r.t. previous Phase A
- At the end of phase A the Agency will produce a Report for Selection and consolidate the relevant programmatic elements for each candidate mission
- The results of the feasibility phase will be presented at a User Consultation Meeting (UCM)
- After the UCM, ESAC will advise D-EOP on the selection of one mission for implementation as the 7th Earth Explorer (EE7)
- On this basis the Director of Earth Observation will make a recommendation to PB- EO on the EE7 mission to be implemented

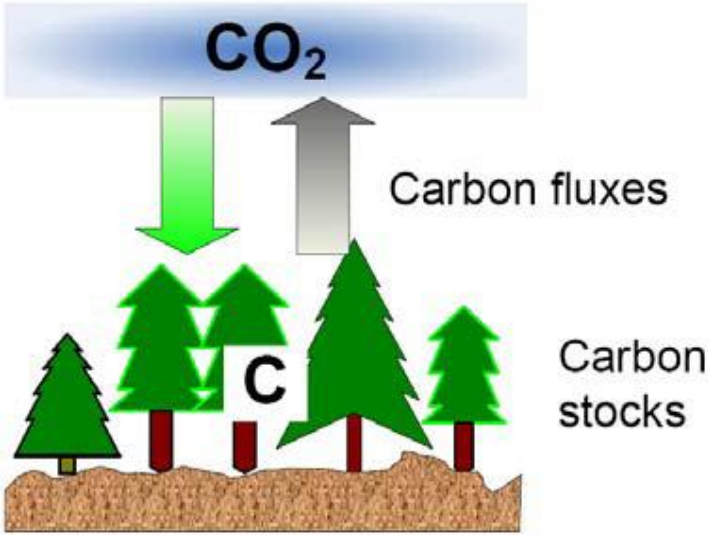
BIOMASS – candidate mission

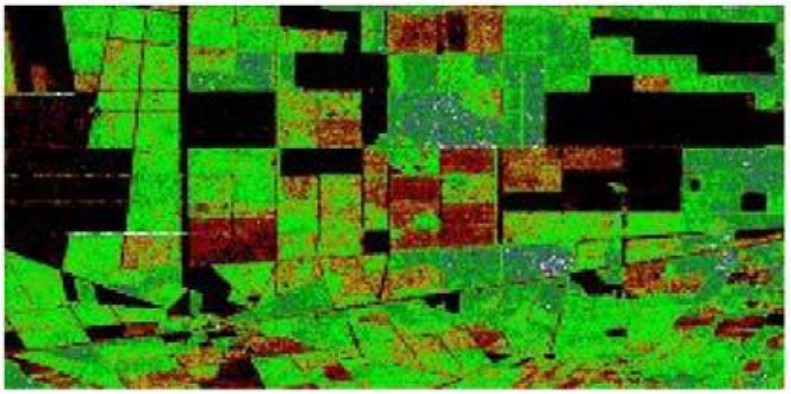
Primary Objective:
To measure above-ground forest biomass, forest extent and forest biomass change over time

Scientific Impact:
To improve the quantification of the global terrestrial carbon cycle by linking BIOMASS mission products with global vegetation models

Technical Concept:

Instrument: P-Band polarimetric SAR
Duration: 5 years
Repeat Time: 25-45 days
Spatial Res: 50 x 50m (≥ 4 looks)
Instrument Modes:
Strip map or dual-beam acquisition
Interferometry
Global coverage (swathwidth of 60-100km)
25-30 degrees incidence angle





CoReH2O – candidate mission

Primary Objective:

Quantify amount and variability of freshwater stored in seasonal snow packs, and snow accumulation on glaciers

Scientific Impact:

To improve hydrological and climate modelling and Numerical Weather Prediction by incorporation of direct observations of snow mass and snow mass variability

Technical Concept:

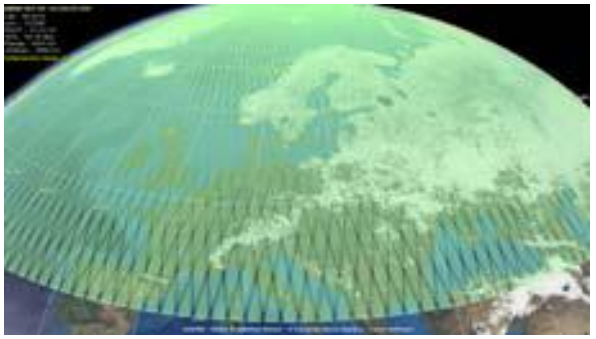
Instrument: SAR in Ku- (17.2 GHz) and X-Band (9.6 GHz), co- and cross-polarisation

Repeat Time: 3 and 15 days / Dawn/Dusk orbits

Spatial Res.: 50 x 50 m (5 looks), ScanSAR (Swath ≥ 100 km)

Two mission phases: Phase 1 (3d repeat): regional high-density time/space repeat coverage

Phase 2 (15 d repeat) Near global coverage of snow and ice areas



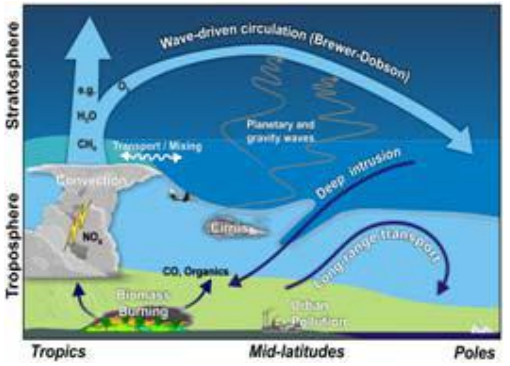
Coverage map for Phase 2 (15 days repeat cycle)

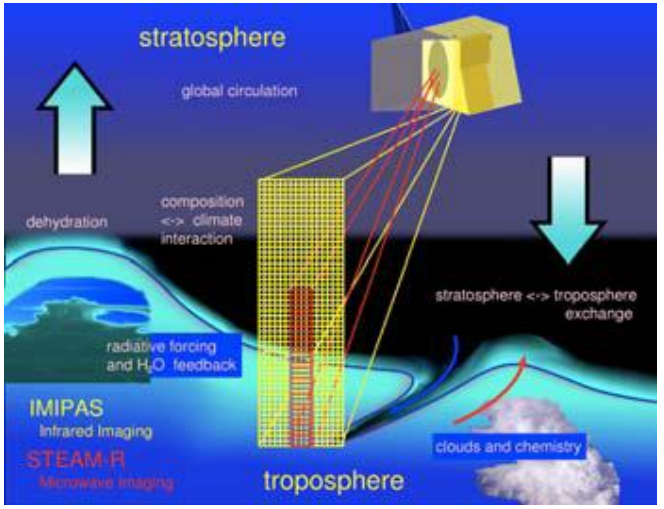
Premier – candidate mission

Primary Objective:
To characterise dynamical and chemical exchange processes in the upper troposphere / lower stratosphere (i.e. tropopause region)

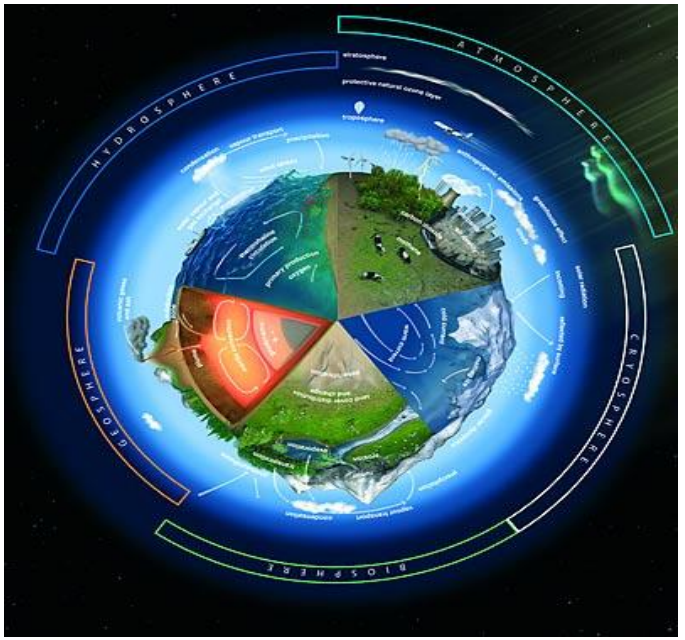
Scientific Impact:
To make observations to characterise and model the key dynamical and chemical processes linking atmospheric composition with Earth's radiation balance and climate

Technical concept:
Payload: - mm-wave push-broom limb spectrometer
- infrared limb-imaging spectrometer
Spatial Res.: 6-55 km vertical
Orbit: sun-synchronous, in tandem with Metop global coverage
Lifetime: 4 years





ESA's Earth Observation Toolkit



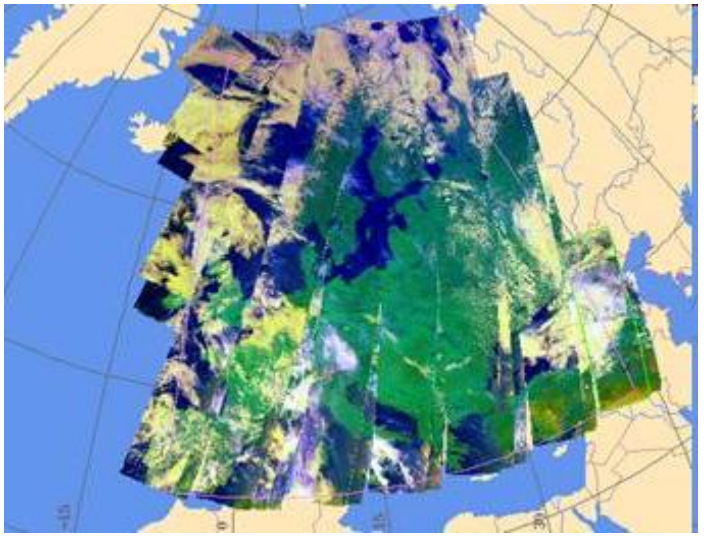
SENTINEL 3
EARTHCARE
ERS
SENTINEL 2
ENVISAT
SENTINEL 1
METEOSAT
AEOLUS
MSG
SWARM
METOP
CRYOSAT
SMOS
GOCE

EE8 status

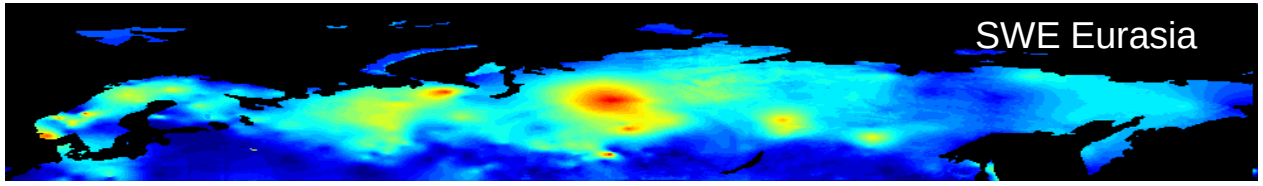
- Call for Proposals issued on 2 October
- Letters of intend received
- Deadline for submissions of full proposals: 1 June 2010
- Strong emphasis on affordability (100 ME max satellite) and technology readiness (TRL 4/5) demonstrable by end Phase A
- Feasibility analyses of up to 3 candidates in 2011

ESA GlobSnow project

- Creating a global database of snow parameters for climate research purposes.
- Fundamental climate data record (FCDR) for GCOS snow ECV:
  - **areal extent of snow (SE):** Based on (A)ATSR VIS and SWIR channels From 1995 -2011, 1 km globally for 1995-1999; from 2000 onwards 1 km globally and 250 m to 500 m for complex terrain. Daily (NRT demo), Weekly and monthly products
  - **snow water equivalent (SWE):** based on AMSR-E (2002 onwards) and SSM/I (1987-2002), 25 km EASE-grid + improved accuracy characterisation



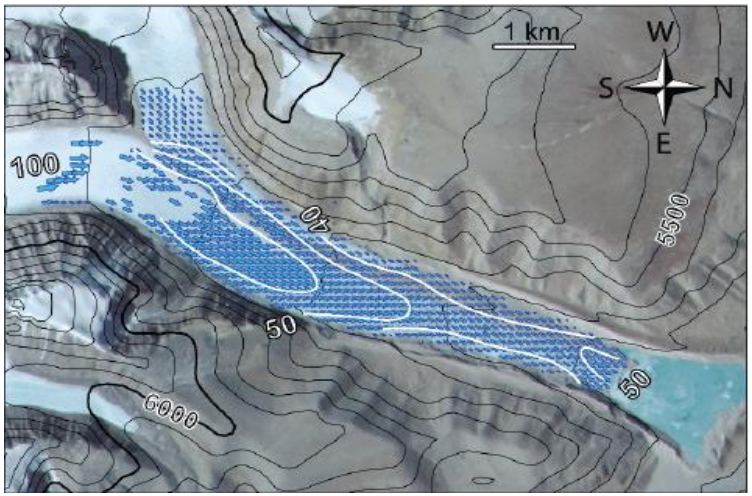
6 days Coverage of AATSR, Europe, 24 – 29 May 2008



http://globsnow.fmi.fi/

ESA GlobGlacier project

- The GlobGlacier projects maps glaciers from key regions all over the world and generates digital glacier outlines fill data gaps in currently existing databases.
- High resolution products include:
  - Digital glacier outlines
  - Snow line and transient snow line
  - Terminus Position
  - Topographic information for the glaciers
  - Changes in glacier surface elevation
  - Velocity fields for glaciers
- Based on DEM, optical and microwave satellite data
- See http://globglacier.ch/



Velocity field on an unnamed glacier in Bhutan derived from matching of repeat pass ASTER data. Ice velocity is also indicated by isolines. (Paul et al 2009)

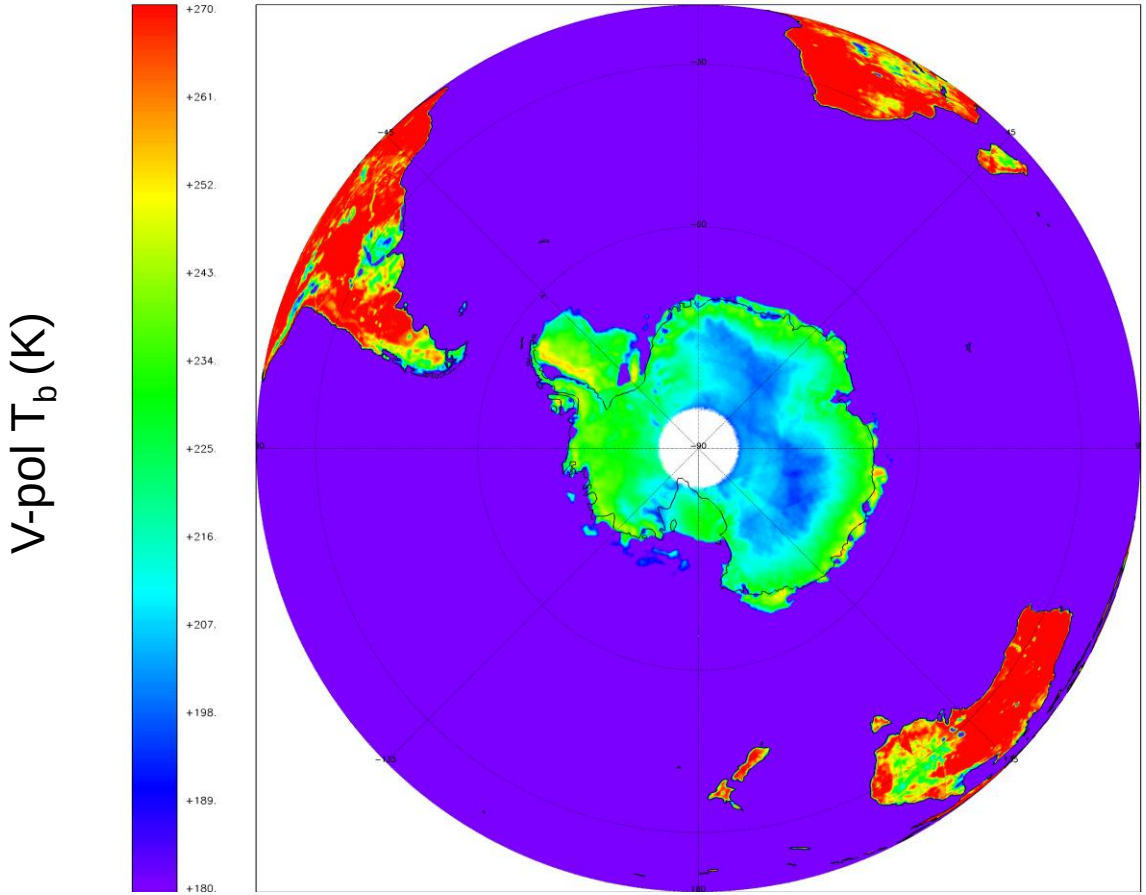
Wishing you a good workshop with the right directions…

….and see you at the Living Planet Symposium in Bergen, Norway, 28 June to 2 July

http://www.esa.int/LivingPlanet2010/

Thank you for your attention

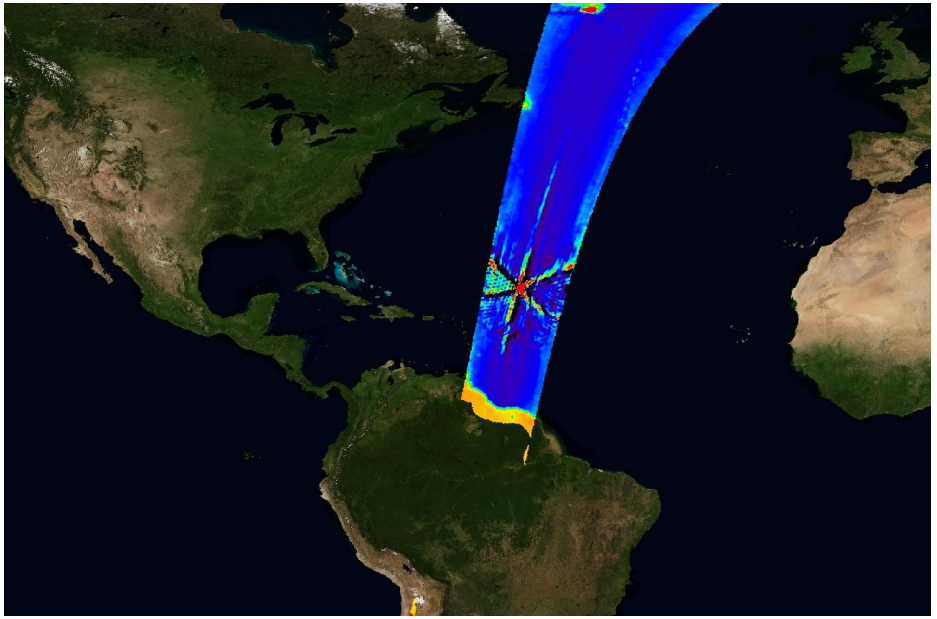
Backup slides



Antarctic plateau around Dome C appears a very good candidate for stability monitoring and across fov consistency check

SMOS – RFI issue

- During the first months of the SMOS commissioning phase RFI has been found to be a major error source contaminating the brightness temperature signals over large parts of the world, especially in Asia, Europe and in coastal zones.
- This significantly impacts the quality of the data in these regions and renders scientific research based on SMOS data products almost impossible. In addition it hinders calibration and validation activities carried out at dedicated test sites in Europe.
- ESA has contacted the respective countries regarding their RFI sources. In addition to the political work ESA also pursues a scientific / technical mitigation of the RFI effect.



Credit: CESBIO