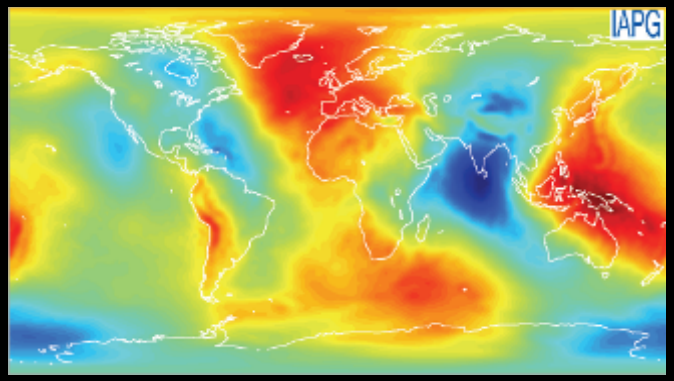
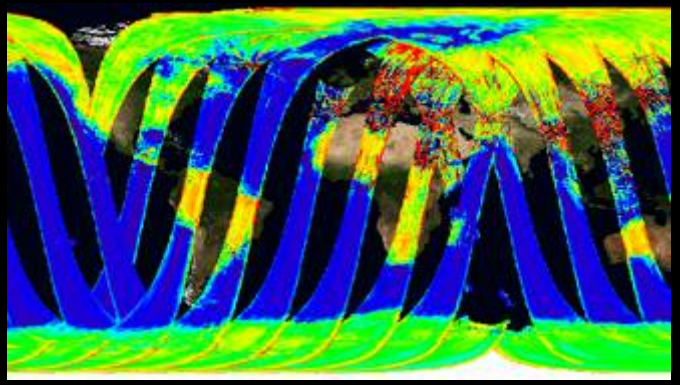
The ESA Earth Observation Programmes & Re-analysis





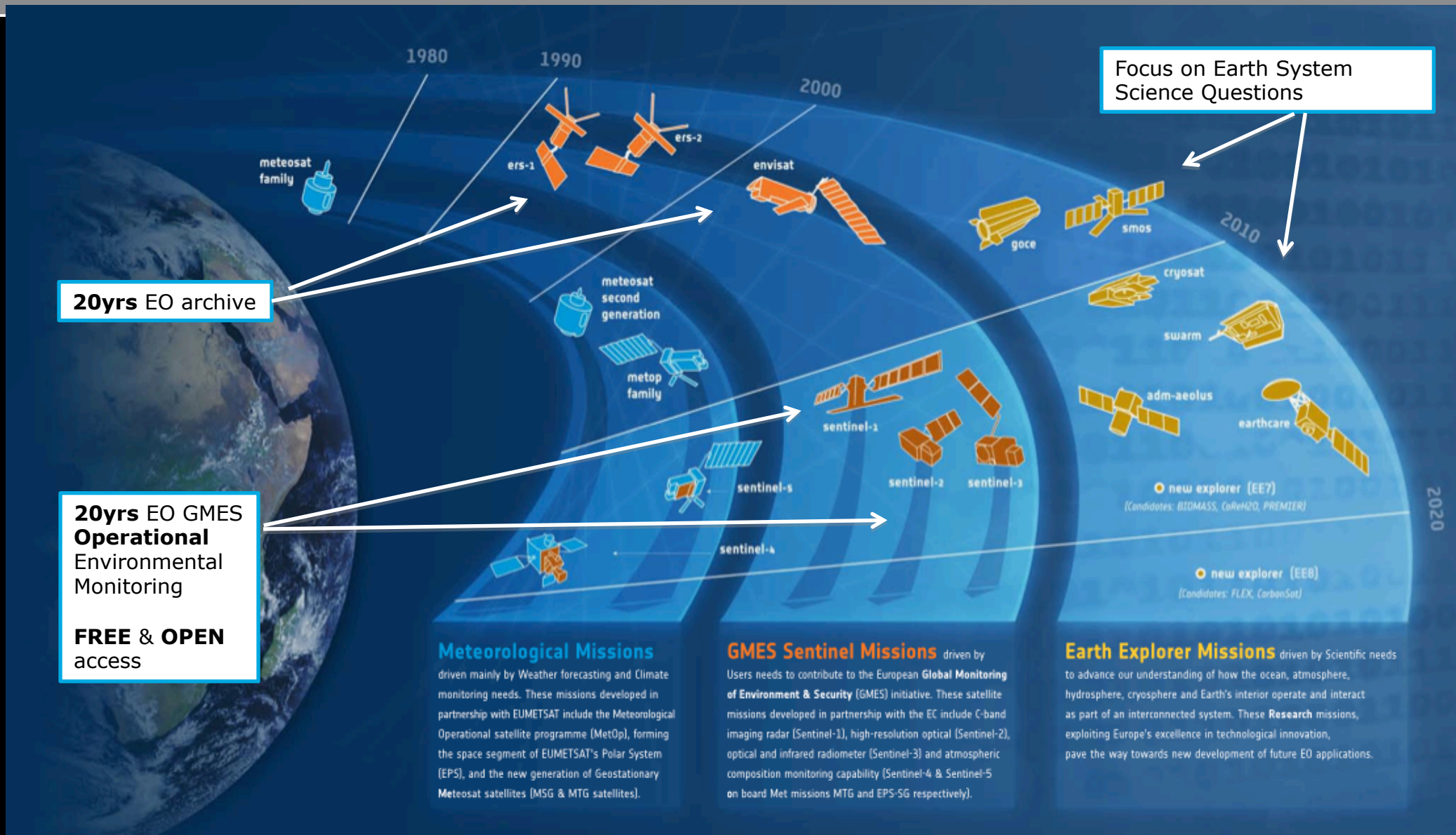
Michael Rast

Head of Science Strategy, Coordination & Planning office

ESA Earth Observation Programmes

WCRP International Conference on Re-analysis, Sylver Spring, Apr 2012

ESA Earth Observation Missions



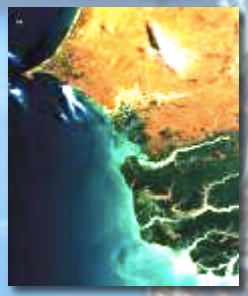
Focus on Earth System Science Questions

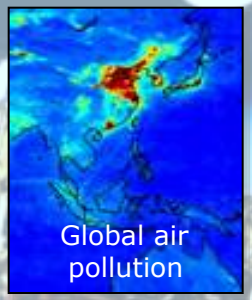
20yrs EO archive

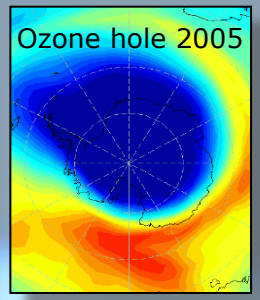
20yrs EO GMES **Operational** Environmental Monitoring

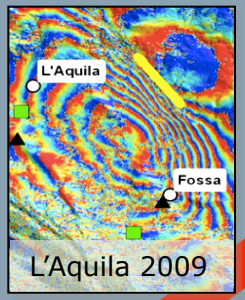
FREE & **OPEN** access

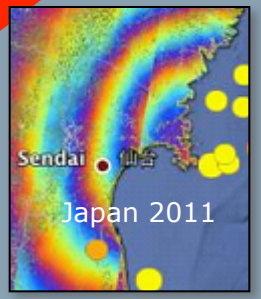
ENVISAT mission: 10 years

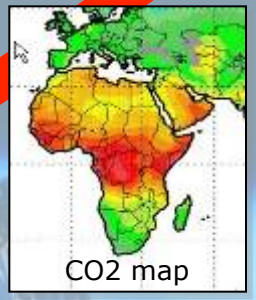


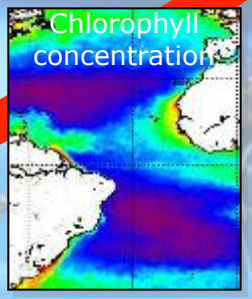


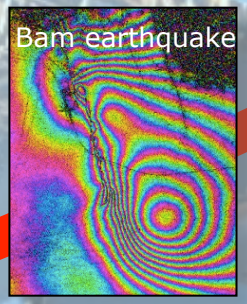


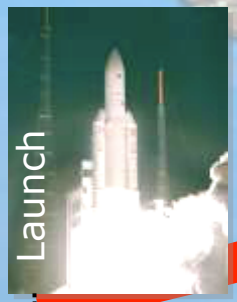












Serving
4000 scientific projects
and
many operational users

Envisat Symposium
Salzburg (A)

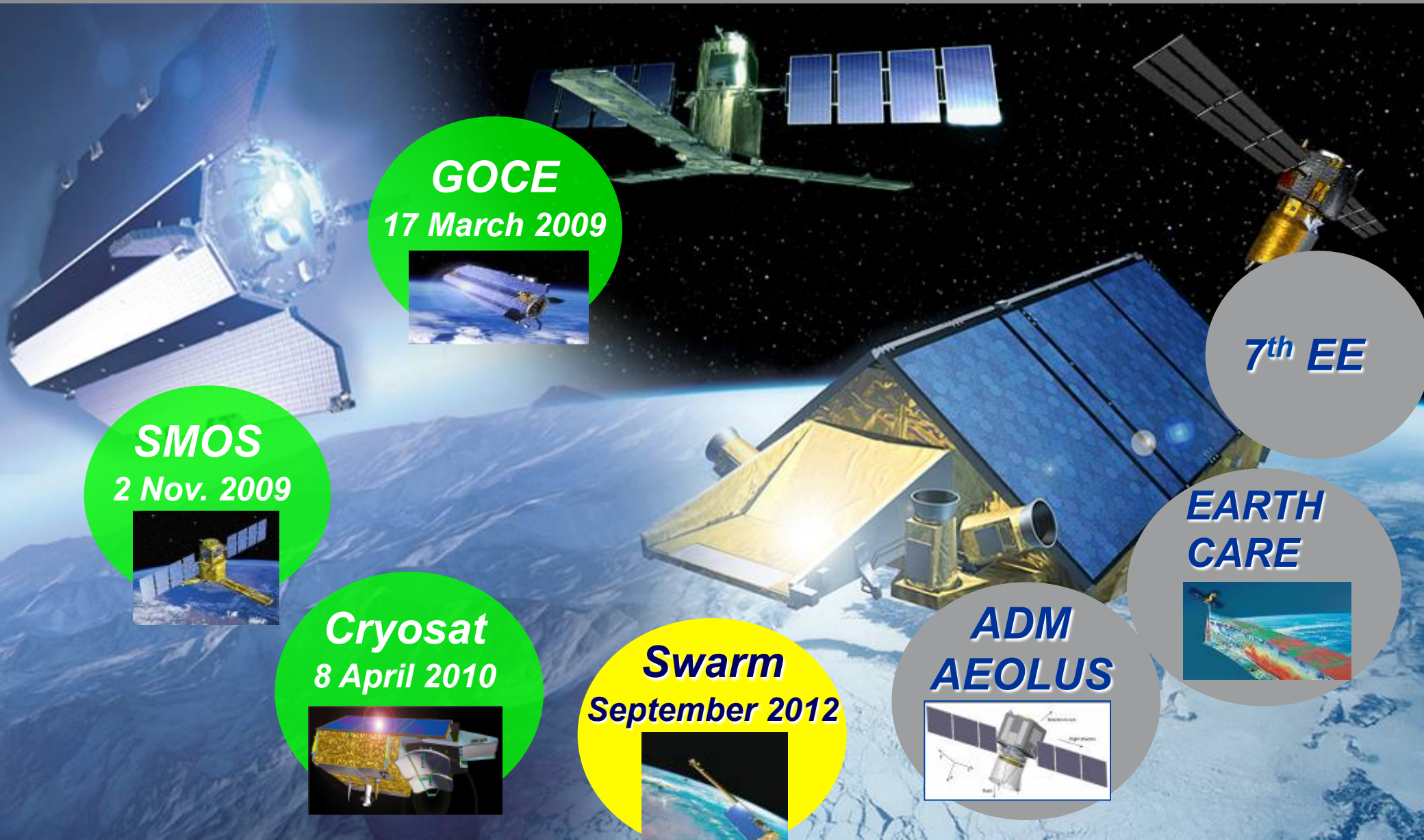
Envisat Symposium
Montreux (CH)

Living Planet Symposium
Bergen (N)

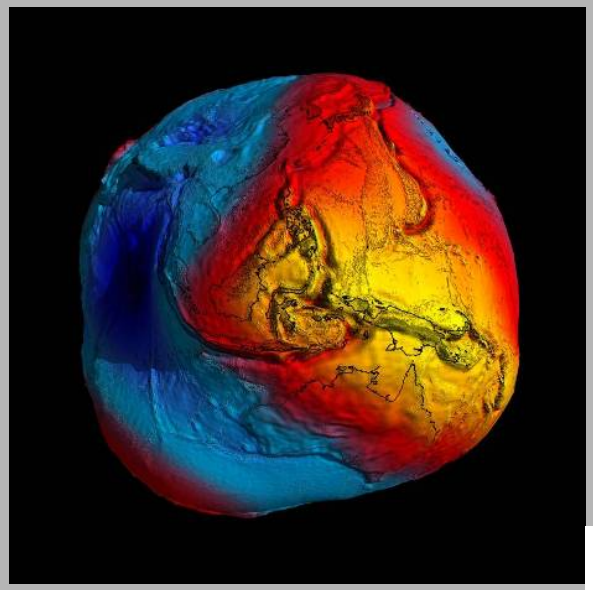
Mar 02 | **Sep 04** | **Apr 07** | **Jun 10** | **Mar 12**

and many workshops dedicated to specific Envisat user communities

The Earth Explorer Missions

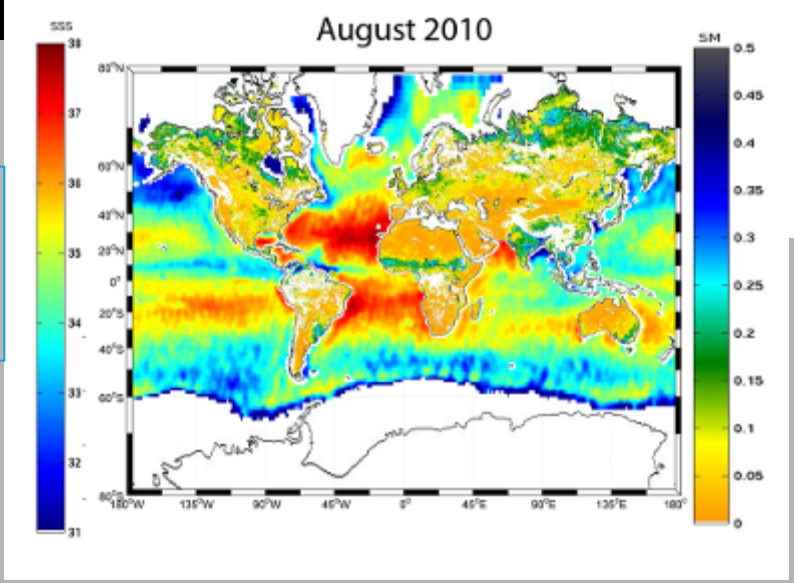


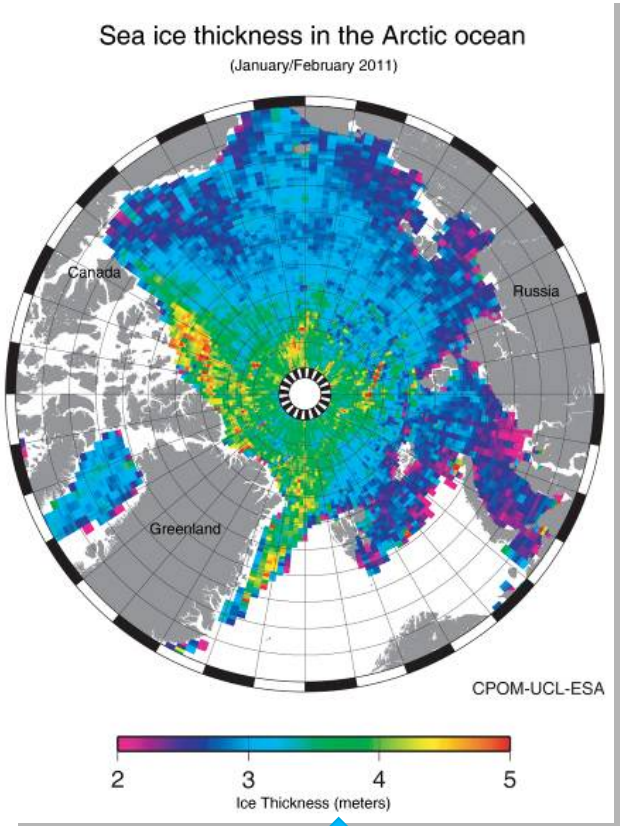
Results of the Explorer Missions



GOCE: most accurate Geiod ever, with unprecedented detail

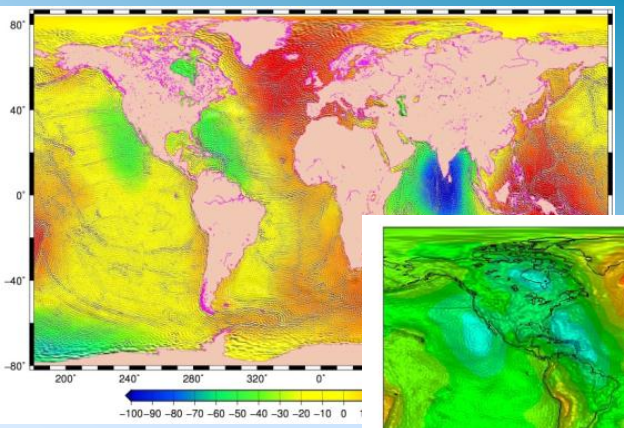
SMOS: first global ocean salinity and soil moisture maps (key variables in the water cycle)



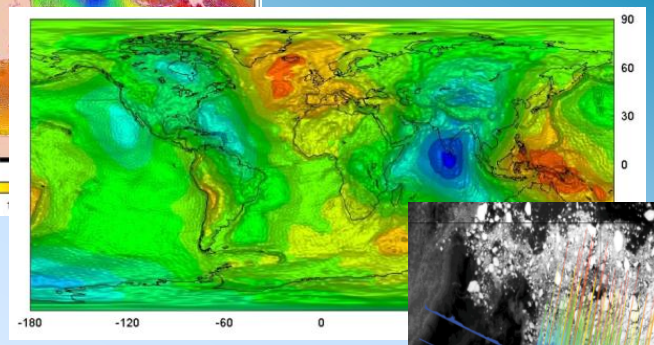


CryoSat: first Arctic sea ice thickness map

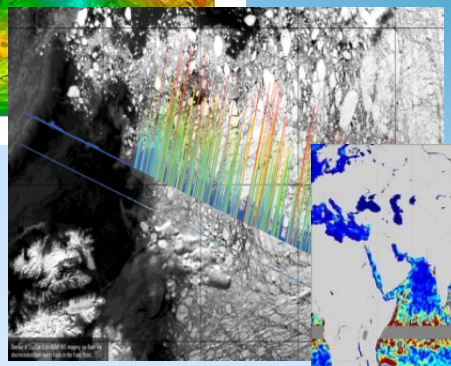
ESA mission synergies



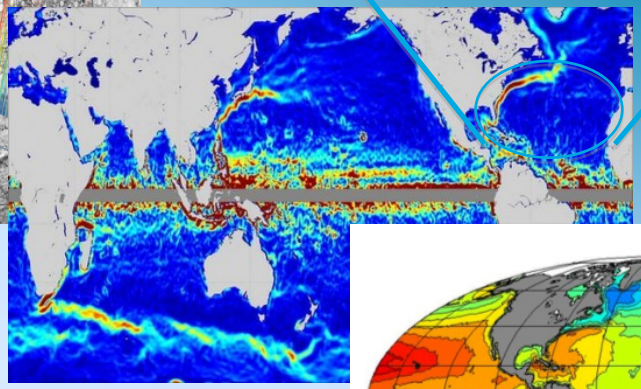
Altimetry map *(Envisat, Jason)*



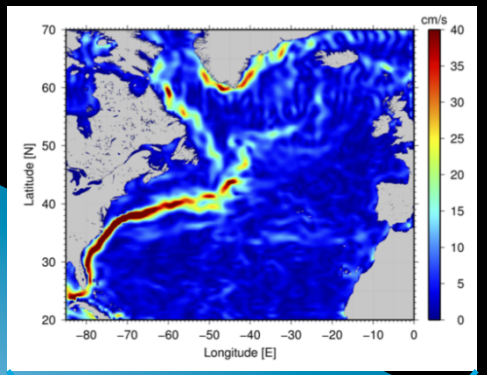
High precision Geoid (GOCE)



CryoSat Data of Ice/Water surface

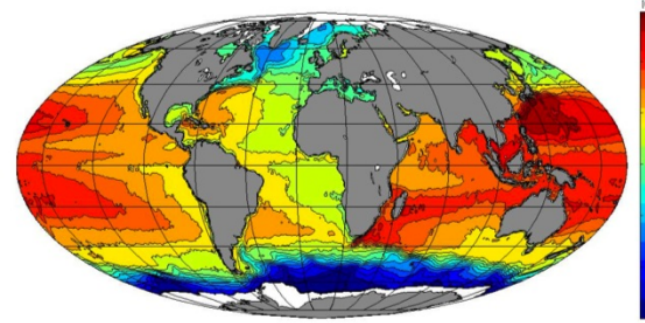


Ocean currents (GOCE)



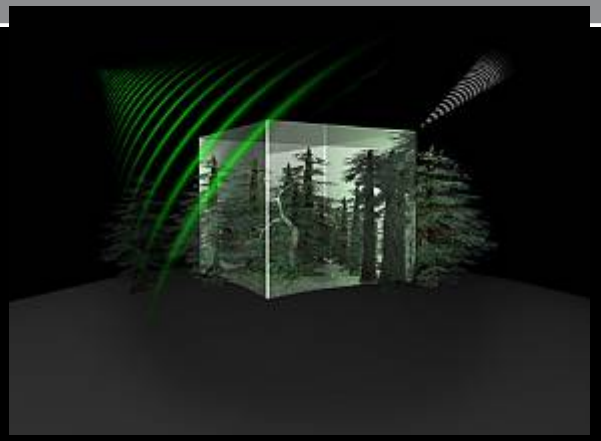
The Gulf Stream

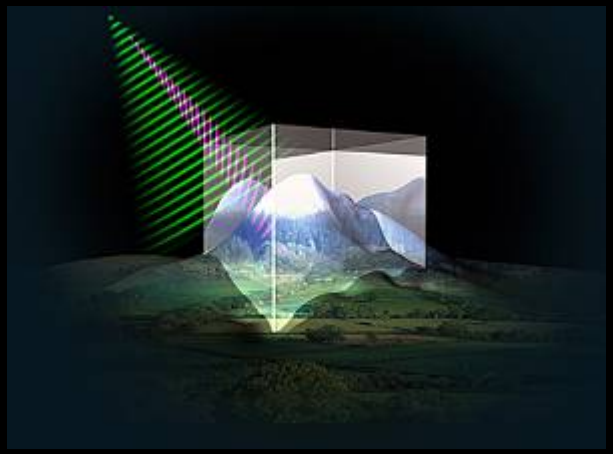
Ocean Dynamic Topography



Earth Explorer 7

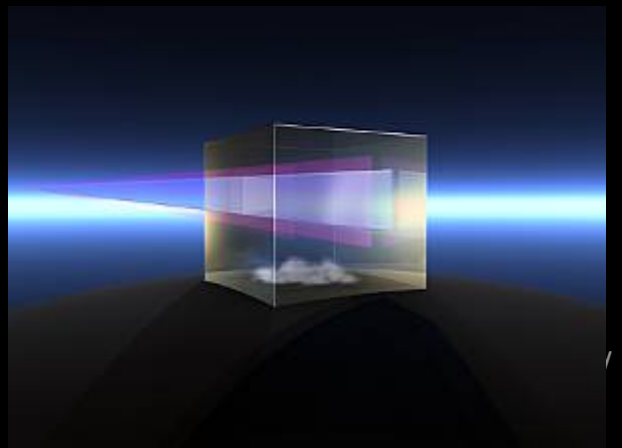
- **BIOMASS:** single satellite carrying a P-band SAR **to provide continuous global interferometric and polarimetric radar observations of forested areas.**



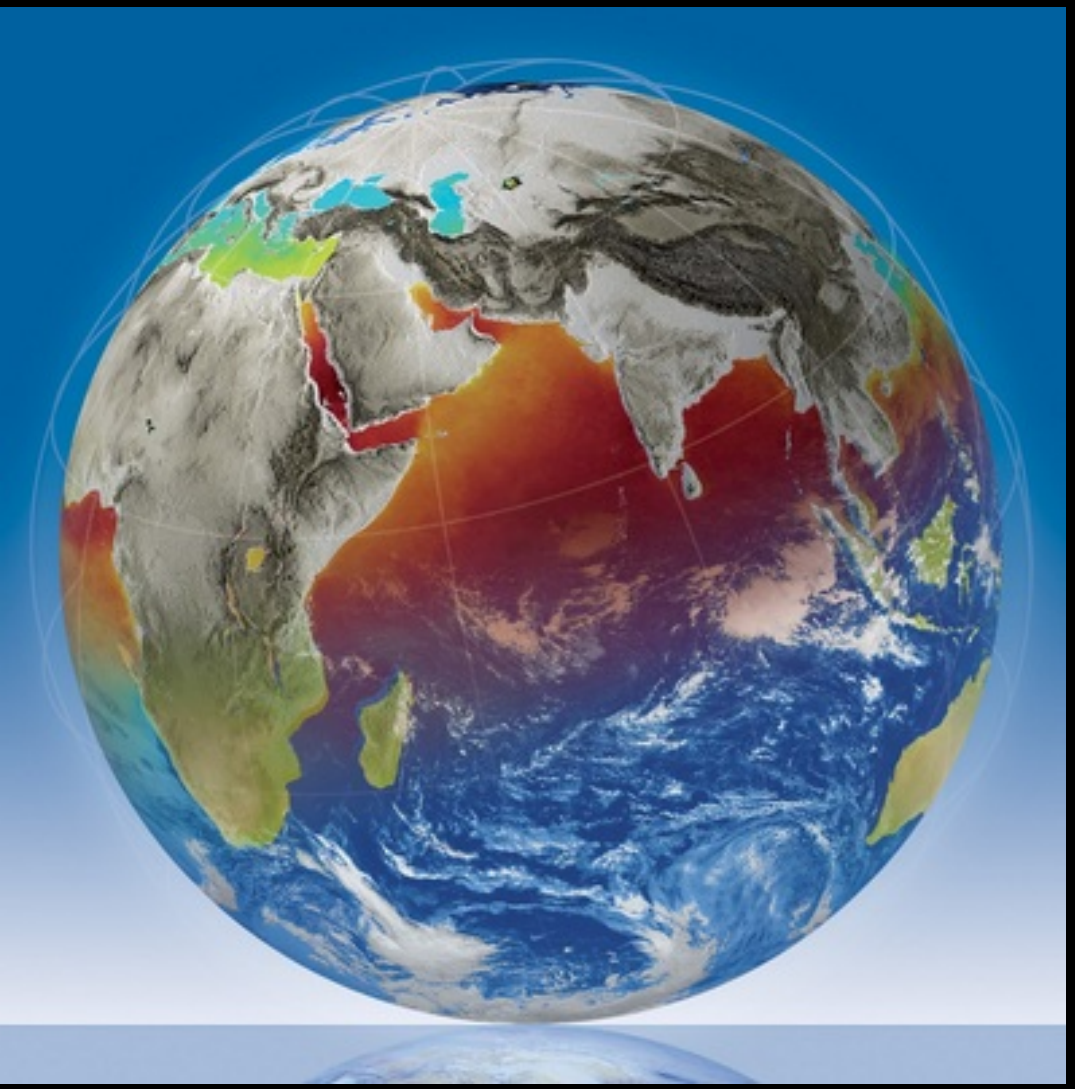


- **CoReH2O / Snow mission:** single satellite with dual frequency (X, Ku), dual-polarisation SAR **to observe snow / ice at high spatial resolution**

- **PREMIER: 3D fields of atmospheric composition in upper troposphere and lower stratosphere.** The instrumentation will consist of an infrared limb-imaging spectrometer and a mm-wave limb-sounder.



Earth Explorer 8



- **FLEX: to provide global maps of vegetation fluorescence, which can be converted into an indicator of photosynthetic activity** -> to improve our understanding of how much carbon is stored in plants and their role in the carbon and water cycles

- **CarbonSat: to quantify and monitor the distribution of carbon dioxide and methane** -> for a better understanding of the sources and sinks of these two gases and how they are linked to climate change.

GMES Space Component infrastructure




Sentinel missions

SAR – Multi-spectral – Ocean/Land – Atmospheric (LEO and GEO); launched from 2013 onwards

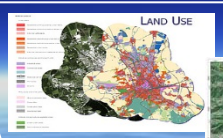


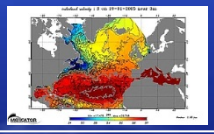





Contributing missions

Free & Open Data Policy



USERS

SERVICES


Distributed Ground Segment

ESA Climate Change Initiative

- ESA EO programmes **essential** for Climate Change monitoring
- **30 years** of EO data archived
- **20 new satellites** launched over next 10 years

Programme goal:

to systematically generate and distribute long-term series of **"Essential Climate Variables" (ECV)** to meet needs of UNFCCC and IPCC

The “ESA Climate Change Initiative”

- **The work of science communities and ESA for 11 selected ECVs has started**
- **ESA is coordinating the programme at international level,** e.g. with EUMETSAT and EU
- **The Climate Change Summits in Copenhagen and Cancun have underlined the importance of this activity**

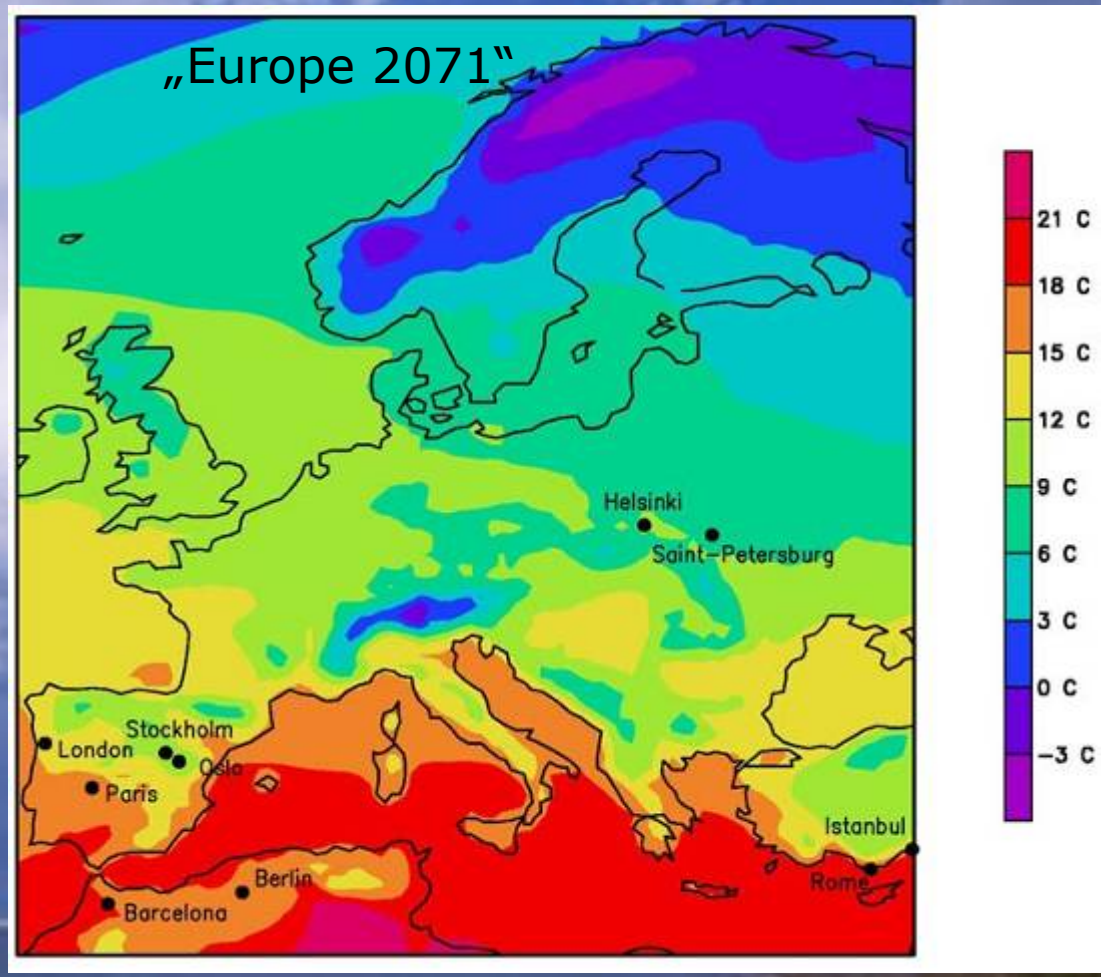
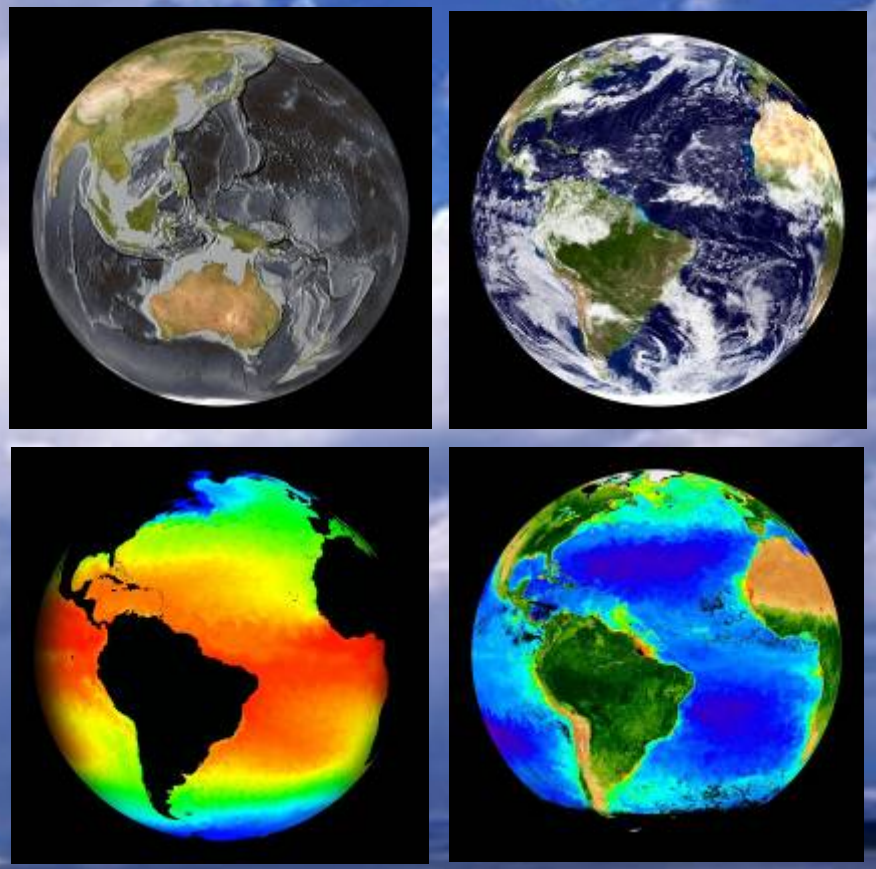


Image: Centre International de Recherche sur l'Environnement et le Développement and Ecole Nationale de la Météorologie, Météo-France

Source: guardian.co.uk

11 Essential Climate Variables

- Cloud Properties
- Carbon Dioxide, Methane & other GHGs
- Ozone
- Aerosol properties
- Sea Surface Temperature
- Sea Level
- Sea Ice
- Ocean Colour
- Glaciers and ice caps
- Land cover
- Fire disturbance



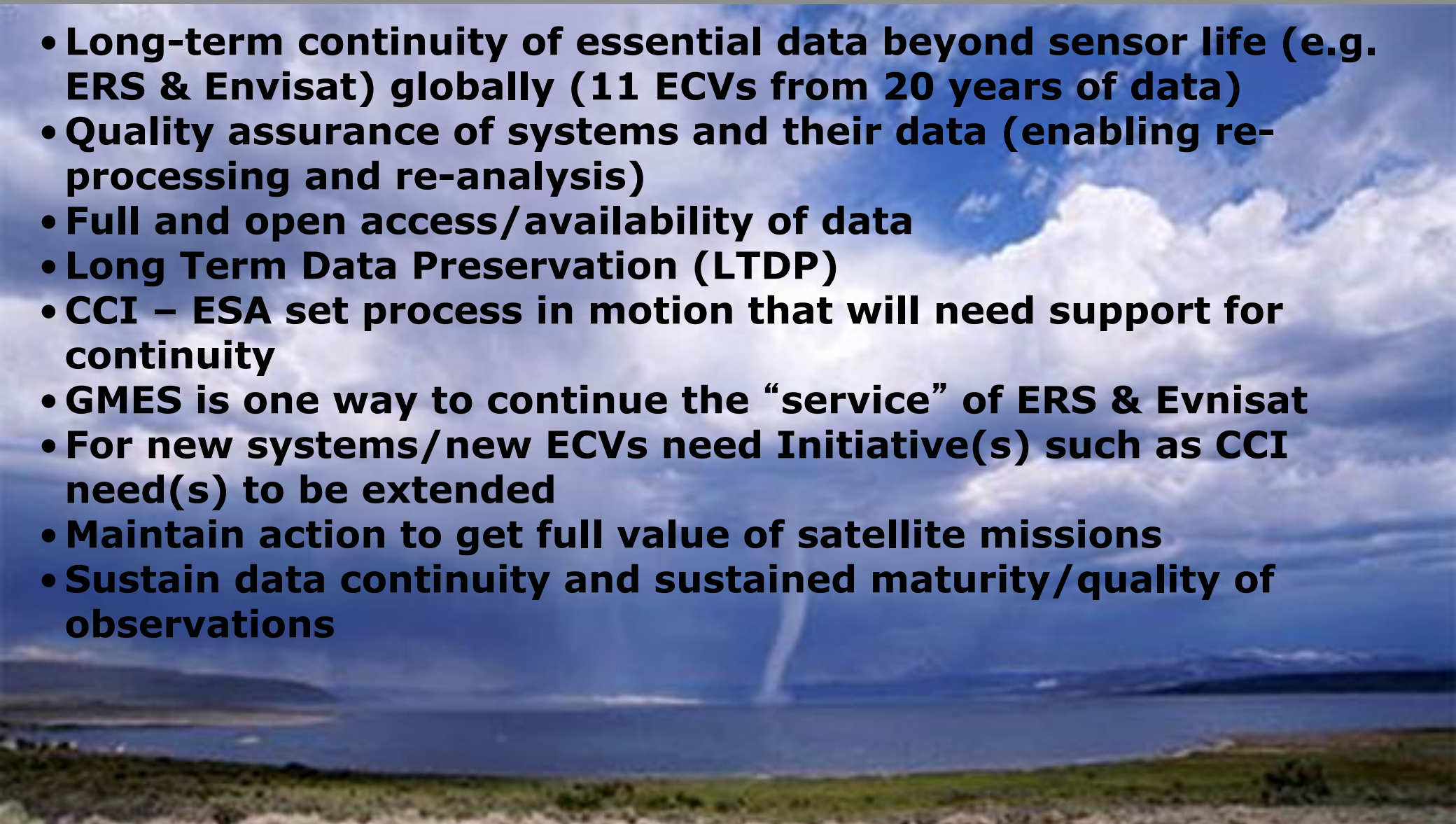
- Use of ECV in Reanalysis for Quaity Assurance

Concluding Remarks

- **Inherent Synergy between EO & Re-analysis**
  - **Global EO data is key part of observing system entering Re-analysis**
  - **Re-analysis supports Data Quality Assessment / Consistency Check (e.g. from Level 1 to higher level products like CCI data sets)**

- **What are the Needs / Opportunities / Mechanisms to foster enhanced & continuous links between EO & Re-analysis communities?**
- **What are the Re-analysis community requirements for space data including data access (e.g. SMOS NRT) ?**
- **In how far do EO-based improvement in forecast, impact quality of re-analysis?**
- **What are the plans for Long Term Data Preservation benefiting Re-analysis ?**
- **Any need for a community Position / White Paper ?**

Plans



- Long-term continuity of essential data beyond sensor life (e.g. ERS & Envisat) globally (11 ECVs from 20 years of data)
- Quality assurance of systems and their data (enabling re-processing and re-analysis)
- Full and open access/availability of data
- Long Term Data Preservation (LTDP)
- CCI – ESA set process in motion that will need support for continuity
- GMES is one way to continue the “service” of ERS & Evnisat
- For new systems/new ECVs need Initiative(s) such as CCI need(s) to be extended
- Maintain action to get full value of satellite missions
- Sustain data continuity and sustained maturity/quality of observations