Satellite Observations Capabilities

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on behalf of the Joint CEOS/CGMS Working Group on Climate
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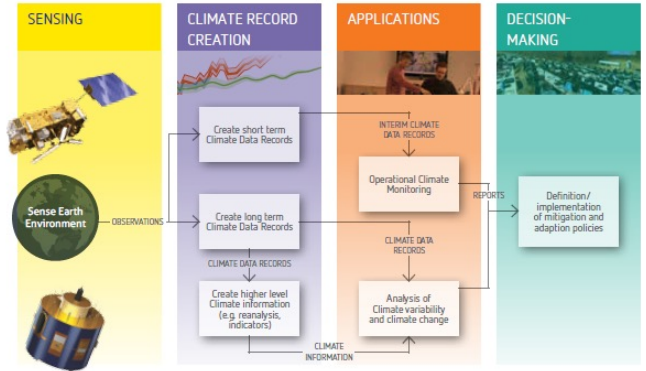
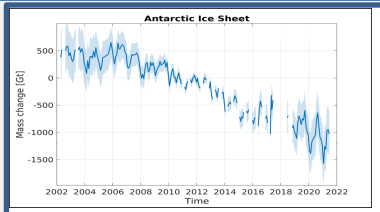
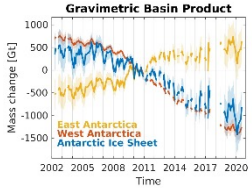
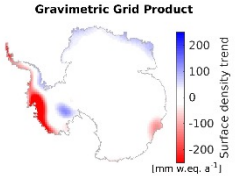
- The Joint CEOS/CGMS Working Group on Climate (JWGClimate) is analysing satellite-derived Climate Data Records (CDRs) of GCOS Essential Climate Variables (ECVs)
- Supports UN Sustainable Development Goals and UNFCCC objectives, including the National Determined Contributions and Global Stocktakes (GST) of the Paris Agreement
- JWGClimate updated its Inventory (v4.0, 2021) following its Architecture for Climate Monitoring from Space (below)
- 1,200 CDRs support user applications, stakeholder decision-making in mitigation and adaptation policy
- Member agencies observation achievements contribute to the long-term goals





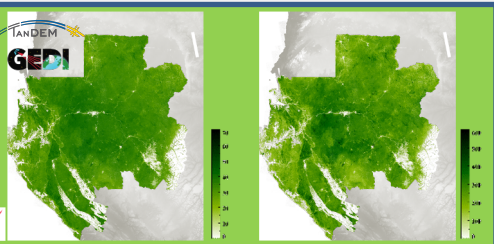
Climate change drives reductions in polar sea ice, and the melting of ice sheets which leads to sea level rise. Ice sheet melt produces a mass imbalance which can be observed by gravimetric missions as NASA's GRACE and GRACE-FO due to gravity change.





The time series for the Antarctica demonstrates the dramatic loss (left) derived from the gravimetric products (right).
GROH & HORWARTH 2021, ESA/CCI

Climate, biogenic and anthropogenic processes lead to complex three-dimensional patterns in forests. Mapping the patterns is required to assess forest states. A new generation of active satellite observations (LIDAR & RADAR) allows global forest mapping and contributes to understanding forest states and changes globally. The combined use of NASA's GEDI and DLR's Tandem-X reveals forest height and mass, providing initial insights into future applications.



Forest Height Map [m] (100 x 100 m²) Forest Biomass Map [t/ha] (100 x 100 m²)

- In support of the Global Stocktake, a Greenhouse Gas systems approach based on constellations for satellites is under development (see Earth Information Day, Nov 3rd) and will provide global information operationally from 2028 forward.
- Efforts are underway to meet the long-term needs of the Paris Agreement (see also CEOS Global Stocktake Strategy).
- Satellite observations are increasingly used in IPCC reporting.
- Capabilities of existing and future missions must be systematically mapped to the needs of the LTGG. One challenge is that the ECV framework continues to evolve due new requirements for additional variables, such as for biodiversity and other areas.

- International Compilation of Long-term Satellite Data Records
- CDRs in Action: Use Cases of Earth Observation Aiding Decision-Making
- Pilot space-based products and harmonization efforts on AFOLU to support the GSTs
- Pilot, Country-scale Top-down Budgets of CO2 Emissions and Removals Associated with Terrestrial Carbon Stock Changes
- Pilot Top-down Methane Emissions Estimates by Sector and Country to Support the Global Stocktakes

Earth Information Day