Abstract:

Satellite earth observation (EO) plays an increasingly important role in monitoring atmosphere, ocean and terrestrial environment and climate. Satellite data, combined with in situ data and numerical models help to understand our planet and how its climate system is changing. The living conditions for future generations are more than ever dependent on decisions being made today on environmental policies. To take the right actions, decision makers, businesses and citizens must be provided with reliable and up-to-date information based on observational data.

The European Earth observation programme Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is a major effort to provide monitoring data based on the European Sentinel programme and other earth observation satellites. Sentinel-1 was launched in April 2014, as the first in a series of satellites under Copernicus that will be in operation in the coming years. The most successful earth observation satellite to date is Envisat, which operated for 10 years, from 2002 to 2012, and delivered 1 Pbyte[1] of data for studies of atmosphere, ocean and terrestrial processes. More than 15000 scientific publications refer to use of data from ENVISAT. Following ENVISAT, several Earth Explorer satellites have been launched by ESA providing innovative data on the earth's gravity field (GOCE), soil moisture and ocean salinity (SMOS) and land ice – sea ice (CryoSat).

Sentinel-1 is a dedicated two-satellite mission carrying C-band Synthetic Aperture Radar (SAR) with primary objective to monitor sea ice, ice sheets, glaciers and the marine environment. In addition the satellites will be used for monitoring land surface, including volcanic and tectonic motion, and for mapping in support of humanitarian aid in crisis situations. The two satellites will have a 6 day repeat cycle, improving the temporal and spatial coverage compared to previous SAR systems.

In Copernicus users will be provided with reliable and up-to-date information through a set of services related to environmental and security issues. The services address six thematic areas: land, marine, atmosphere, climate change, emergency management and security. They support a wide range of applications, including environment protection, management of urban areas, regional and local planning, agriculture, forestry, fisheries, health, transport, climate change, sustainable development, civil protection and tourism. Marine environmental monitoring: maritime safety, the marine environment and coastal regions, marine resources as well as seasonal meteorological forecasting and climate monitoring.

In order to improve the utilization of EO data for climate research, ESA has launched the Climate Change Initiative (CCI). The goal of the CCI programme is to systematically generate and distribute long-term series of "Essential Climate Variables" to meet the needs of UNFCCC and IPCC. In a series of CCI-projects archives of EO data from ESA, NASA and other space agencies are analyzed to provide consistent data sets on cloud, aerosol, carbondioxide, methane and other greenhouse gases, ozone, sea surface temperature, sea level, ocean colour, sea ice, glaciers and ice caps, land cover, fire disturbance and soil moisture.

The Sentinel programme will have a free and open data policy, making it easy for many users to obtain data and data products.

[1] 1 Petabyte = 10^{15} byte (1 mill Gigabyte)