

# Status report on the current and future satellite systems by the European Space Agency (ESA)

Presented to CGMS-45, Plenary session, agenda item D4

## RESULTS OF THE MINISTERIAL COUNCIL, 1-2 DECEMBER 2016

- ❖ Earth Observation receives € 1.55 billion (out of >10)
- ❖ This amount covers in particular:
  - EOEP-5: 1,158 M€ (1,410 M€ requested => 82%)
  - GMECV: 83 M€ (90 M€ requested => 93%)
  - Earthnet and LTDP (Basic Activities): 130 M€
- ❖ EOEP-5 (2017-2021) is the backbone of the Earth observation program, addressing:
  - Science but also societal challenges (climate, water, food security, SDG, etc.)
  - Continuity as well as new concepts

## OVERVIEW – PLANNING OF ESA SATELLITE SYSTEMS



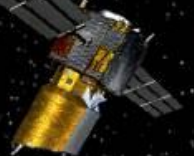
ESA'S EARTH EXPLORER SATELLITES – HIGH-END SCIENCE RESEARCH MISSIONS

**GOCE**  
17 March 2009 -  
11 November 2013

**SMOS**  
2 Nov. 2009



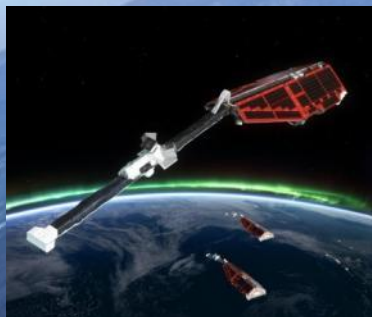
**ADM-AEOLUS**  
2018



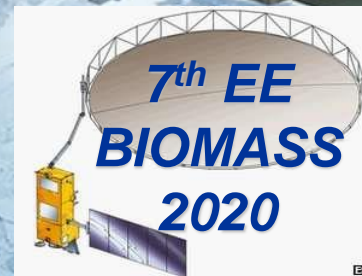
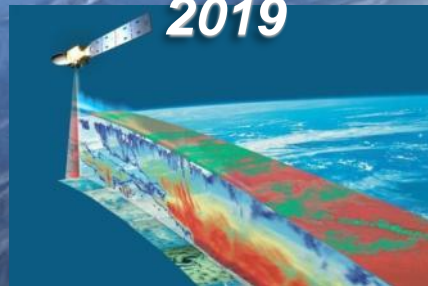
**CryoSat-2**  
8 April 2010



**SWARM**  
22 November 2013



**EARTH  
CARE**  
2019



**8<sup>th</sup> EE  
FLEX**  
2022

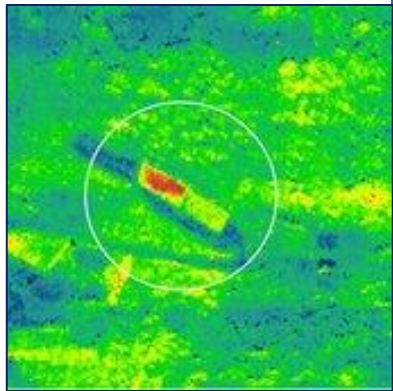
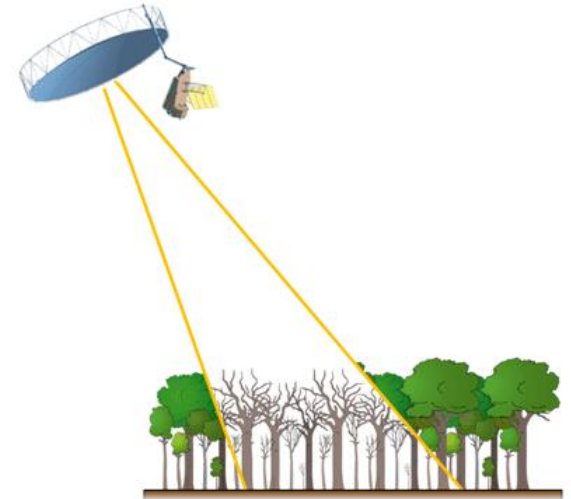




## FUTURE EARTH EXPLORER SATELLITES

BIOMASS will be the 7<sup>th</sup> Earth Explorer:

- ❖ **BIOMASS** will provide **continuous global interferometric and polarimetric Radar observations of forested areas**, essential to the understanding of the role of forests in Earth's **carbon cycle** and in **climate change**.



FLEX will be the 8<sup>th</sup> Earth Explorer:

- ❖ **FLEX** will provide **global maps of vegetation fluorescence to quantify photosynthetic activity** to improve our understanding of the way carbon moves between plants and the atmosphere and how photosynthesis affects the carbon and water cycles.

COPERNICUS – A NEW GENERATION OF DATA SOURCES



## ❖ Copernicus is a European space flagship program

- ESA is responsible for the space component, Sentinel development, operation of some Sentinels, data buy from other partners, and system evolution
- The Sentinels – most comprehensive EO system world-wide for environmental monitoring
- Free and open data policy

## COPERNICUS SPACE COMPONENT – UPCOMING LAUNCHES



- COPERNICUS provides the necessary data for operational monitoring of the environment and for civil security

Sentinel-1A – launched 3 April 2014

Sentinel-1B – launched 25 April 2016



Sentinel-2A – launched 23 June 2015



Sentinel-2B – launched 7 March 2017

Sentinel-3A – launched 16 February 2016

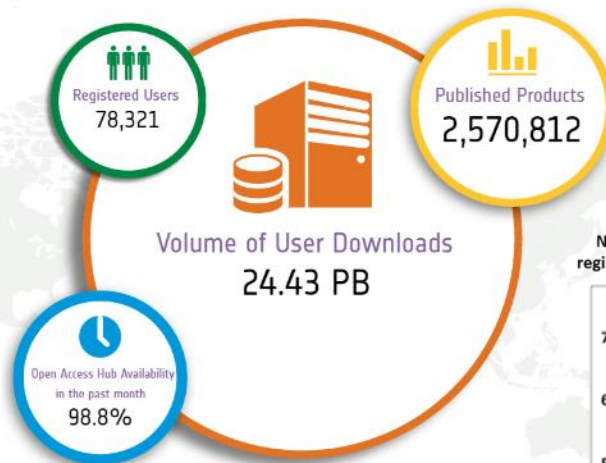


Sentinel-3B – launch March 2018

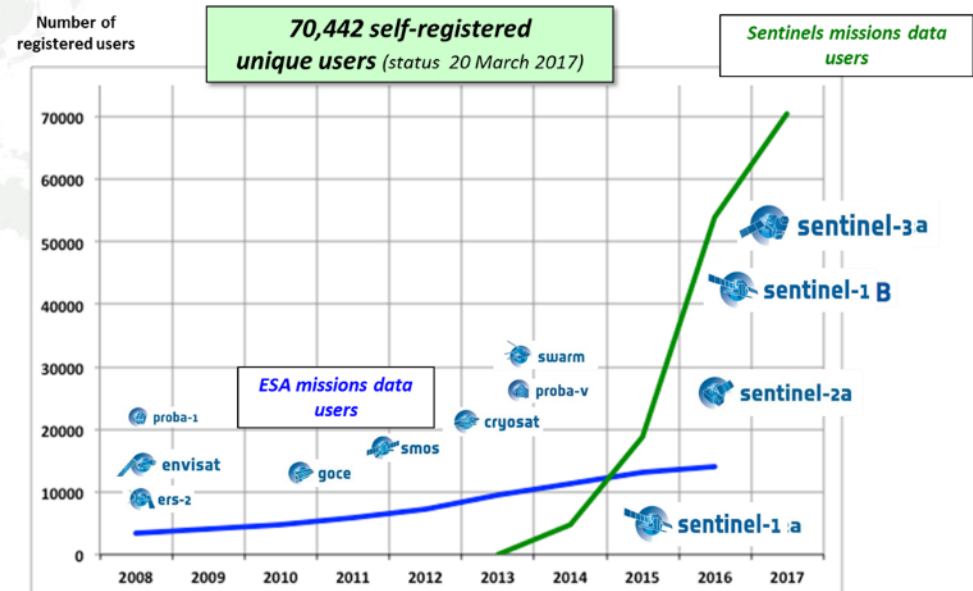
Sentinel-5Precursor due for launch on 21 September 2017

Sentinel-6A (aka Jason-CS) planned for launch in 2020

## COPERNICUS – ALREADY A SUCCESS STORY



status as of  
22 May 2017

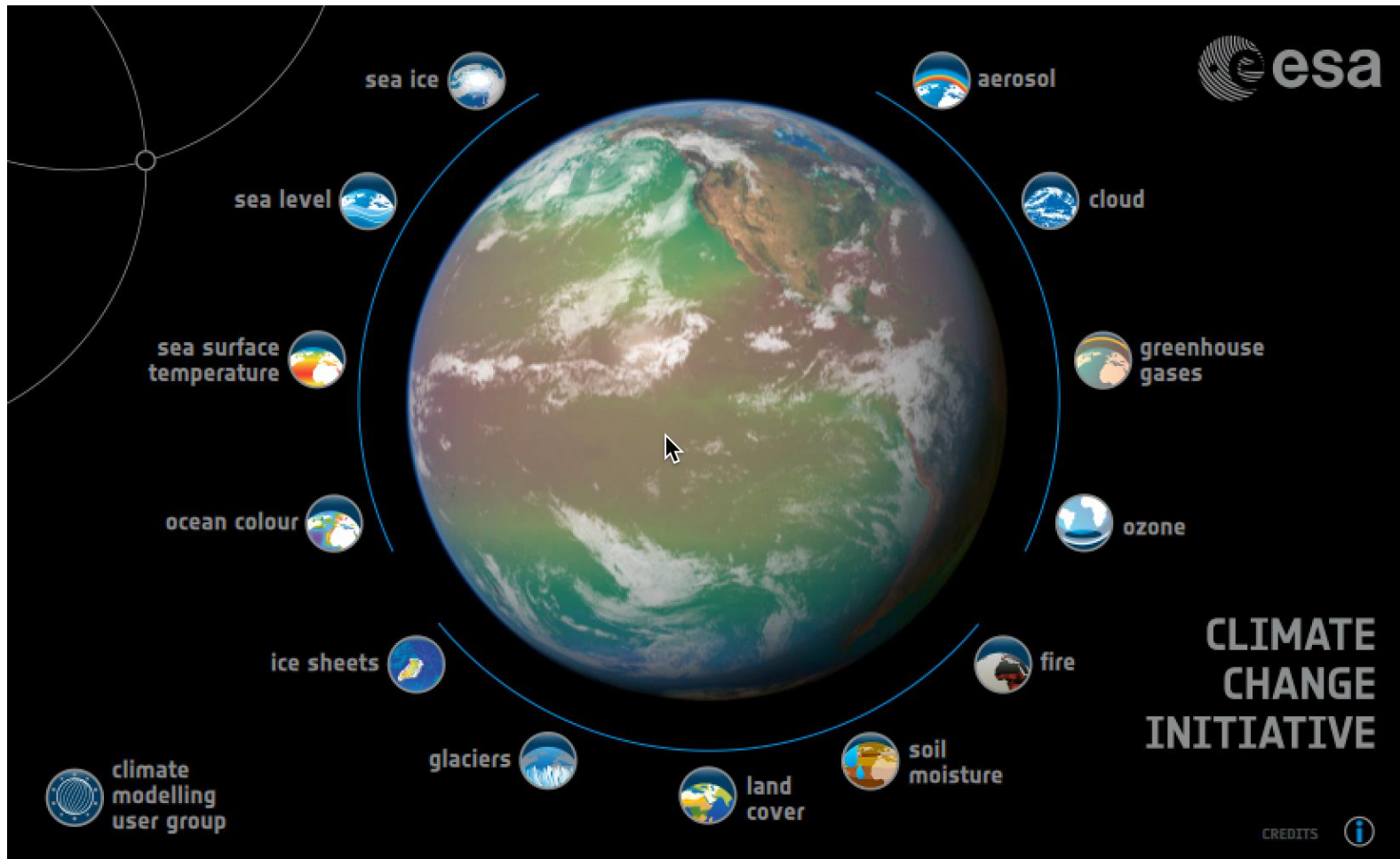




## SENTINEL EXPANSION

- ❖ The following Sentinels shall be confirmed as a result of a user consultation process and following a gap analysis
  - Sentinel-7: an anthropogenic CO<sub>2</sub> monitoring mission
  - Sentinel-8: a Thermal Infrared Imager (companion to Sentinel-2 C/D) for observation over land and coastal regions in support of agriculture management services
  - Sentinel-9: two components
    - S-9 ICE: Enhanced Ice and Snow Continuity mission
    - S-9 HEO: Polar Weather Payload on a Highly Elliptical Orbit
  - Sentinel-10: a Hyper-spectral mission in support of agriculture, food security, biodiversity, mineral resources, soils

## THE ESA CLIMATE CHANGE INITIATIVE



## THE ESA CLIMATE CHANGE INITIATIVE: PLANS FOR THE FUTURE

❖ ESA is extending the CCI activities (called GMECV) for the period 2018-2026 to:

➤ Cover nine new ECVs:

- Salinity, sea state, high resolution land cover, snow, lakes, above-ground biomass, permafrost, land surface temperature, water vapor

➤ Continue R&D activities and the set of ECVs already part of CCI

➤ Study multiple ECV topics (such as Fluxes, Cycles etc...); and,

➤ Strengthen outreach activities (data access, user tool box, visualization, post docs research grants).

## METEOROLOGICAL MISSIONS

### ❖ Cooperation model:

- ESA develops prototype satellites and, on behalf of EUMETSAT, procures recurrent satellites
- EUMETSAT operates the satellites
- Currently Meteosat Second Generation (MSG) in GEO and MetOp in LEO
- MSG-3 and Metop-B launched in 2012, MSG-4 launched in July 2015, Metop-C in 2017
- MeteoSat 3<sup>rd</sup> Generation (MTG) and Metop 2<sup>nd</sup> Generation (Post-EPS) under development, to launch in next decade

