ESA's Earth Observation Programmes, the Copernicus Programme and India

ISPRS TC V Mid Term Symposium
Dehradun, 20th November

Steven Hosford, ESA/CNES
CEOS Executive Officer


esa
The European Space Agency

Purpose of ESA

"To provide for and promote, for **exclusively peaceful purposes**, cooperation among European states in **space research** and **technology** and their **space applications.**"

Article 2 of the ESA Convention

ESA was established in 1975

ESA facts and figures

- Over 50 years of experience
- 22 Member States
- Eight sites/facilities in Europe, about 2300 staff
- 5.6 billion Euro budget (2018)
- Over 80 satellites designed, tested and operated in flight

ESA EO Programmes in 2018

709 People

555 in EOP

154 in other ESA Directorates

Budget

€ 1.5 bn

5 Sites

ESRIN

ECSAT

HQ

ESTEC

EBO

ESA-DEVELOPED EARTH OBSERVATION MISSIONS

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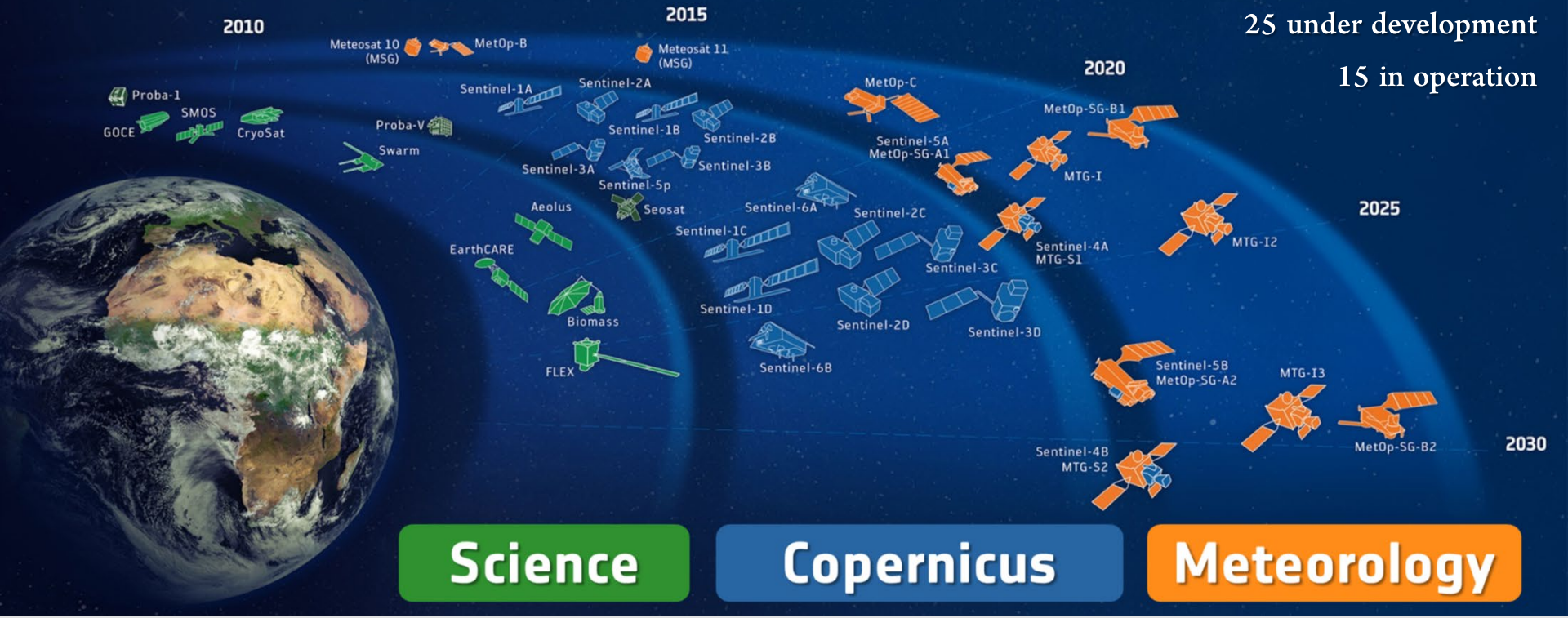
Satellites

25 under development

15 in operation



Science | **Copernicus** | **Meteorology**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The Earth Explorers

The Earth Explorers Missions

- Science driven programme
- Mission selection proposed by a peer committee "Advisory Committee for Earth Observation"
- Financed through the Earth Observation Envelope Programme (EOEP)
- On average one mission every 2 years

Explorer Core Missions

Major missions covering primary research objectives

Fast Track Missions

Smaller research and demonstration missions

Science: Earth Explorers

flex
→ ESA'S FLUORESCENCE MISSION

2022

biomass
→ ESA'S FOREST MISSION

2022

earthcare
→ ESA'S CLOUD, AEROSOL & RADIATION MISSION

2021

aeolus
→ ESA'S WIND MISSION

2018

goce
→ ESA'S GRAVITY MISSION

2009 – 2013

smos
→ ESA'S WATER MISSION

2009 – Present

cryosat
→ ESA'S ICE MISSION

2010 – Present

swarm
→ ESA'S MAGNETIC FIELD MISSION

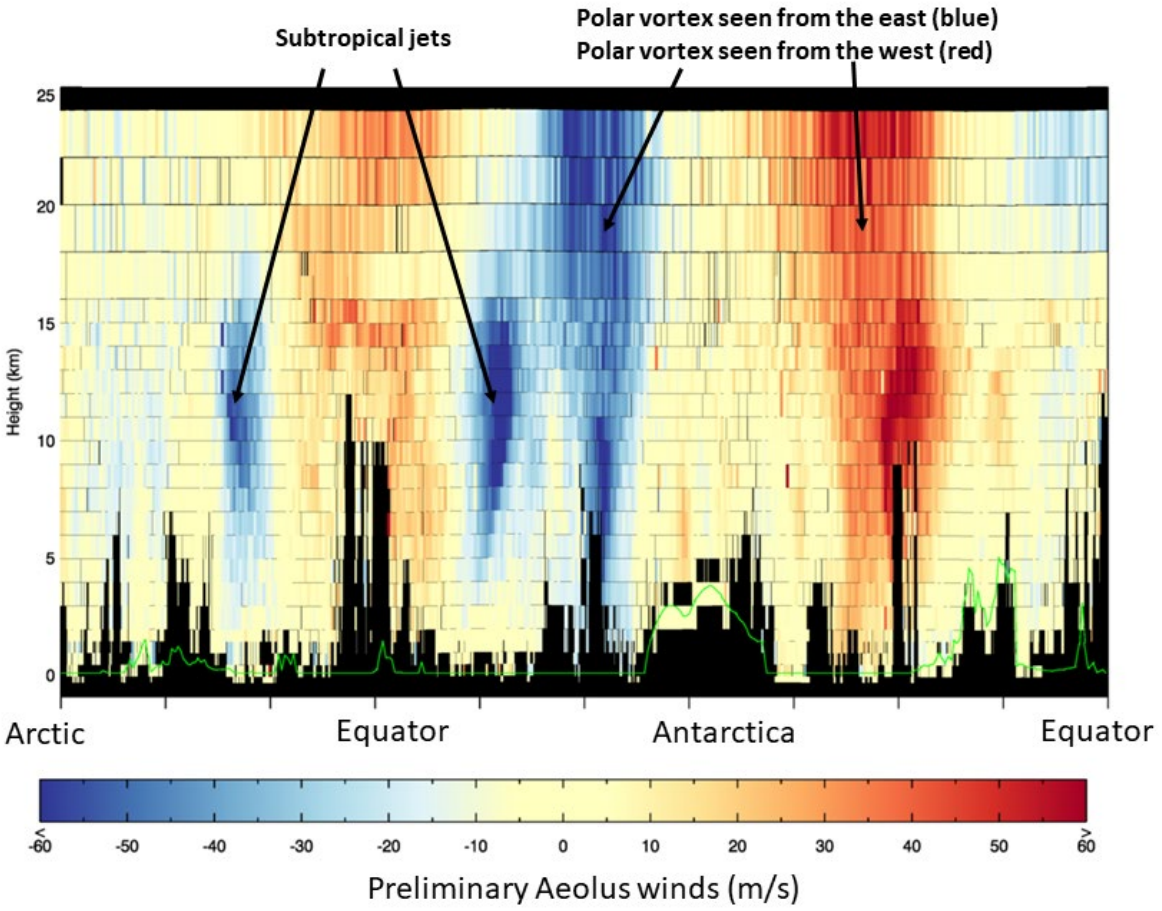
2013 – Present

GOCE, SMOS, CRYOSAT, SWARM, AEOLUS, EARTHCARE | Credit: ESA/AOES Medialab | BIOMASS Credits: Airbus | FLEX Credits: Thales Alenia

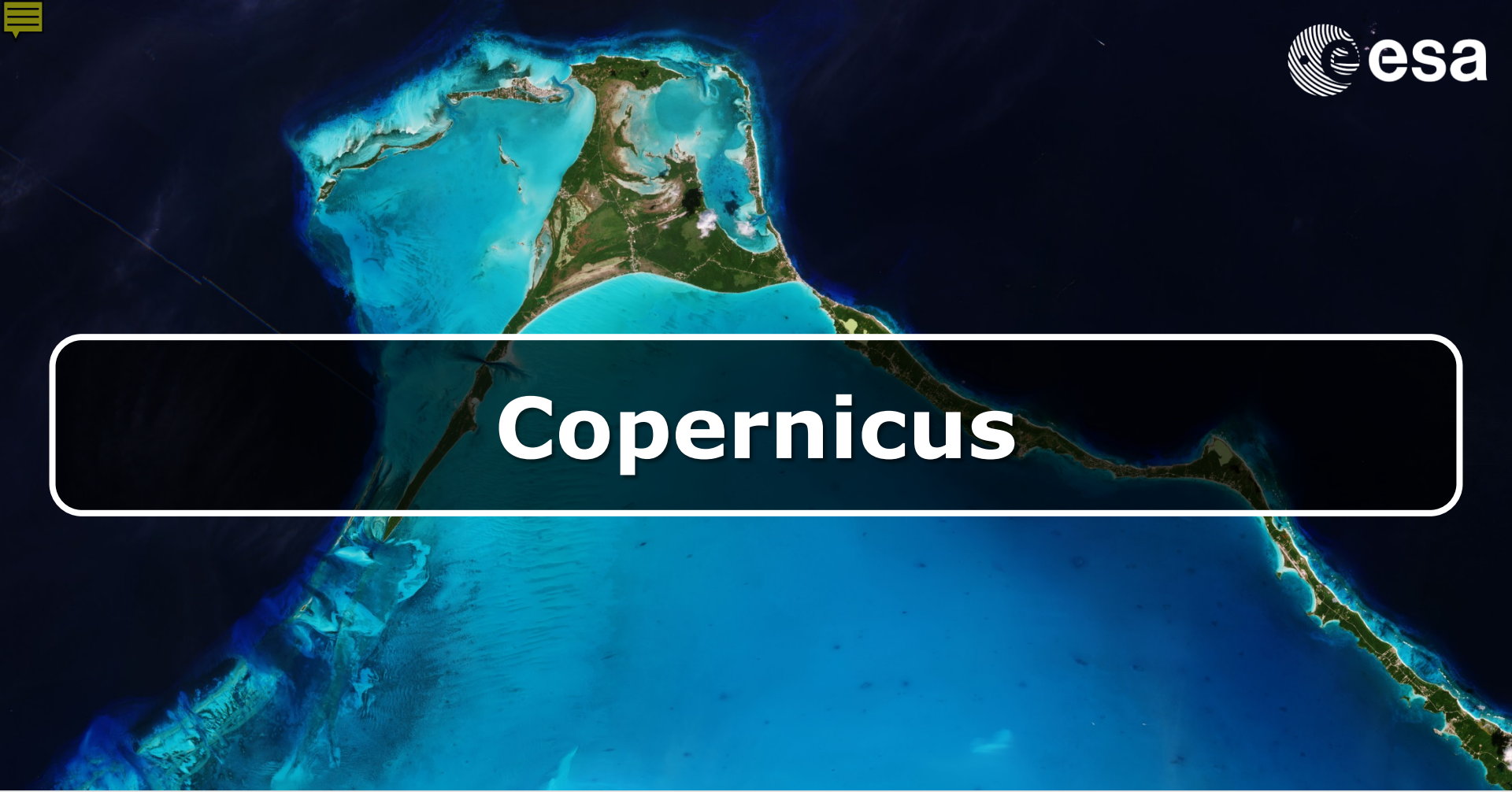
Aeolus

Launched 22 Aug. 2018
Wind Mission
First ever UV LIDAR in Space

Aeolus



12 September 2018


Copernicus

Copernicus – a new Phase in EO

European Earth Observation System

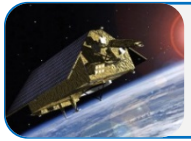
- Led by the EU
- EU-ESA Collaboration

European response to global needs:

- to manage the environment
- to mitigate the effects of climate change
- to ensure civil security

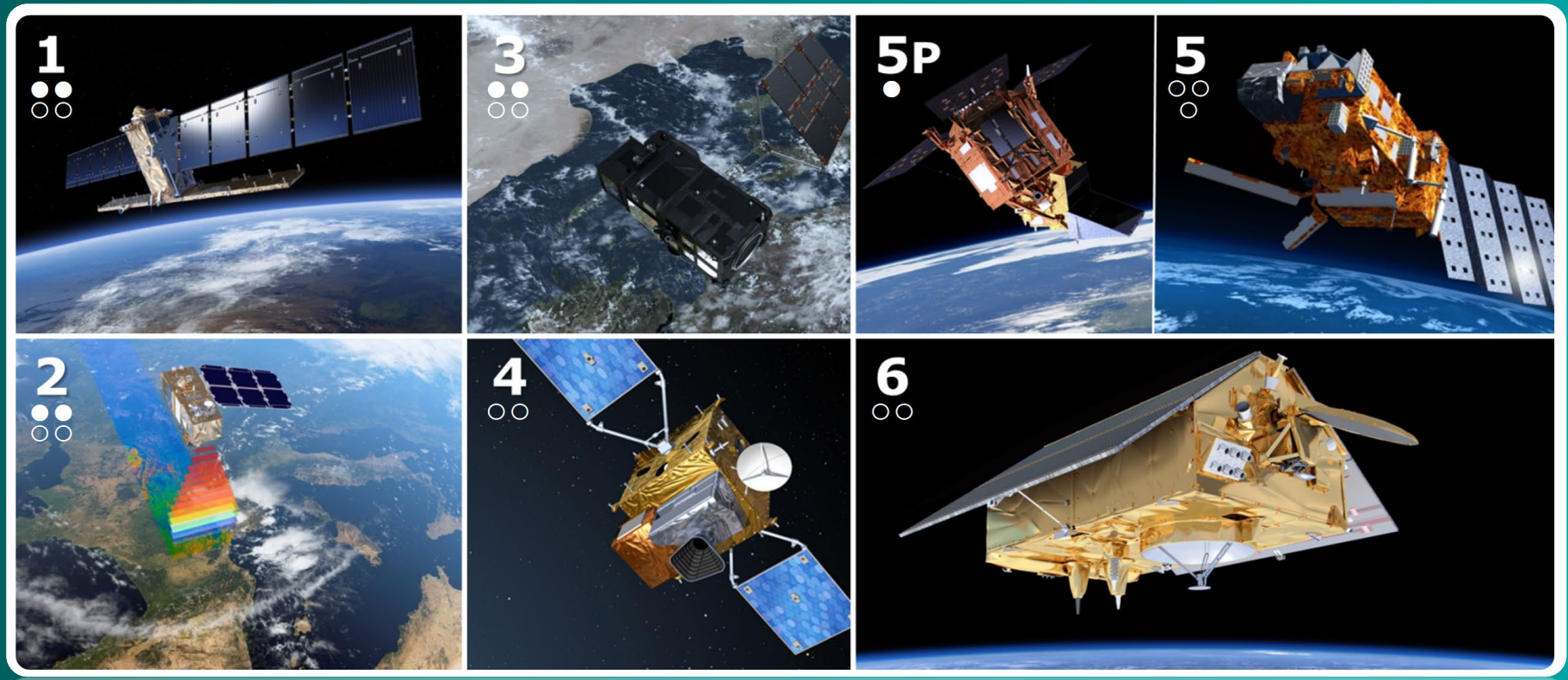
European independence, contribution to global system (GEOSS)

CSC: Sentinel Satellites

	**Sentinel 1** (A/B/C/D) **SAR Imaging**	All weather, day/night applications, interferometry
	**Sentinel 2** (A/B/C/D) **Multispectral Imaging**	Land applications: urban, forest, agriculture, … Continuity of Landsat, SPOT
	**Sentinel 3** (A/B/C/D) **Ocean & Global Land Monitoring**	Wide-swath ocean colour, vegetation, sea/land surface temperature, altimetry
	**Sentinel 4** (A/B) **Geostationary Atmospheric**	Atmospheric composition monitoring, pollution; instrument on MTG satellites
	**Sentinel 5** (A/B/C) & Precursor **Low-Orbit Atmospheric**	Atmospheric composition monitoring; instrument on MetOp-SG satellites
	**Sentinel 6** **Jason CS (A/B)**	Altimetry reference mission

The Big Data Revolution

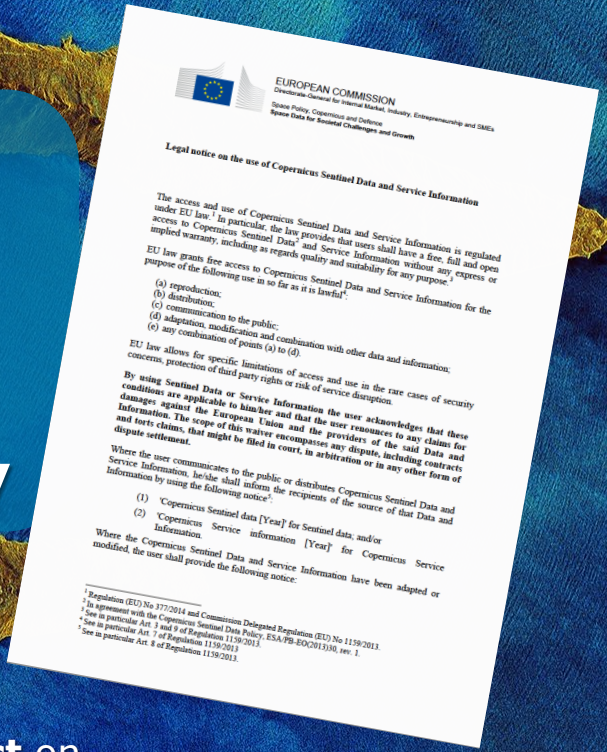
Copernicus is the largest producer of EO data in the world



Copernicus Sentinel Data Policy

Sentinel data are available:

- ✓ **Free, Full and Open***
- ✓ **Over very long term**
- ✓ **Systematically, Operationally**



EUROPEAN COMMISSION
Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
Space Policy, Copernicus and Defence
Space Data for Societal Challenges and Growth

Legal notice on the use of Copernicus Sentinel Data and Service Information

The access and use of Copernicus Sentinel Data and Service Information is regulated under EU law.[1] In particular, the law provides that users shall have a free, full and open access to Copernicus Sentinel Data[2] and Service Information without any express or implied warranty, including as regards quality and suitability for any purpose.[3]

EU law grants free access to Copernicus Sentinel Data and Service Information for the purpose of the following use in so far as it is lawful[4]:

(a) reproduction;
(b) distribution;
(c) communication to the public;
(d) adaptation, modification and combination with other data and information;
(e) any combination of points (a) to (d).

EU law allows for specific limitations of access and use in the rare cases of security concerns, protection of third party rights or risk of service disruption.

By using Sentinel Data or Service Information the user acknowledges that these conditions are applicable to him/her and that the user renounces to any claims for damages against the European Union and the providers of the said Data and Information. The scope of this waiver encompasses any dispute, including contracts and torts claims, that might be filed in court, in arbitration or in any other form of dispute settlement.

Where the user communicates to the public or distributes Copernicus Sentinel Data and Service Information, he/she shall inform the recipients of the source of that Data and Information by using the following notice[5]:

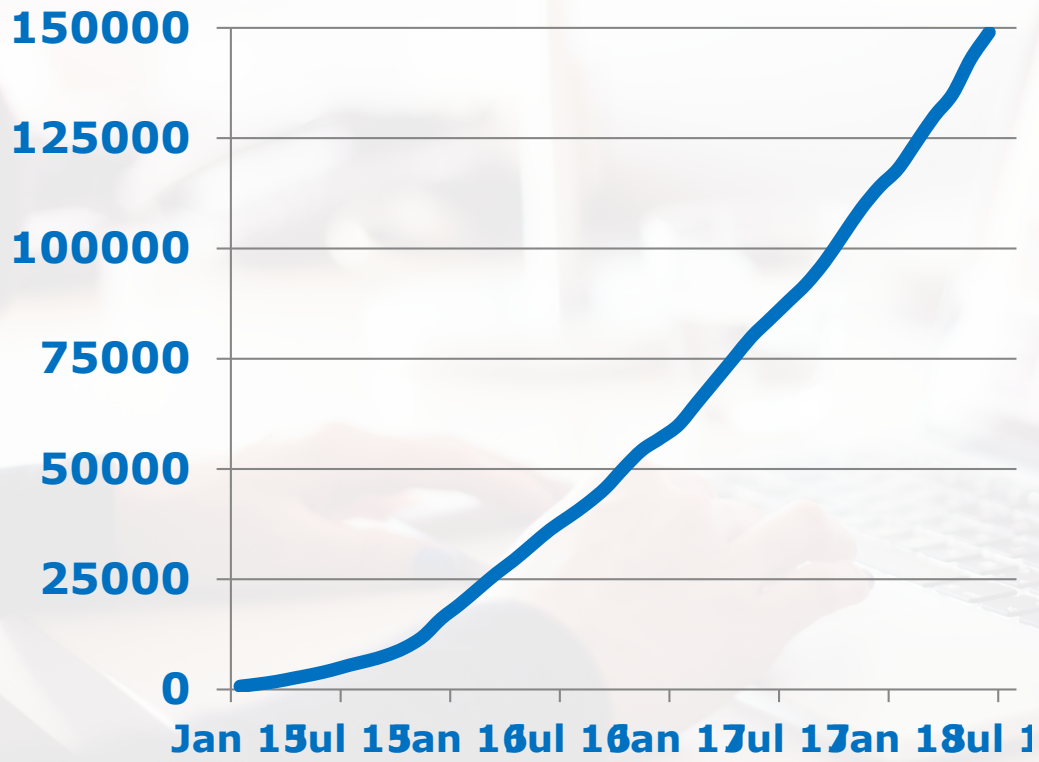
(1) 'Copernicus Sentinel data [Year]' for Sentinel data; and/or
(2) 'Copernicus Service information [Year]' for Copernicus Service Information.

Where the Copernicus Sentinel Data and Service Information have been adapted or modified, the user shall provide the following notice:

[1] Regulation (EU) No 377/2014 and Commission Delegated Regulation (EU) No 1159/2013.
[2] In agreement with the Copernicus Sentinel Data Policy, ESA/PB-EO(2013)30, rev. 1.
[3] See in particular Art. 3 and 9 of Regulation 1159/2013.
[4] See in particular Art. 7 of Regulation 1159/2013.
[5] See in particular Art. 8 of Regulation 1159/2013.

*** ESA Sentinel Data Policy** (Sep 2013) and **EU Delegated Act** on Copernicus Data and Information Policy (Dec 2013)

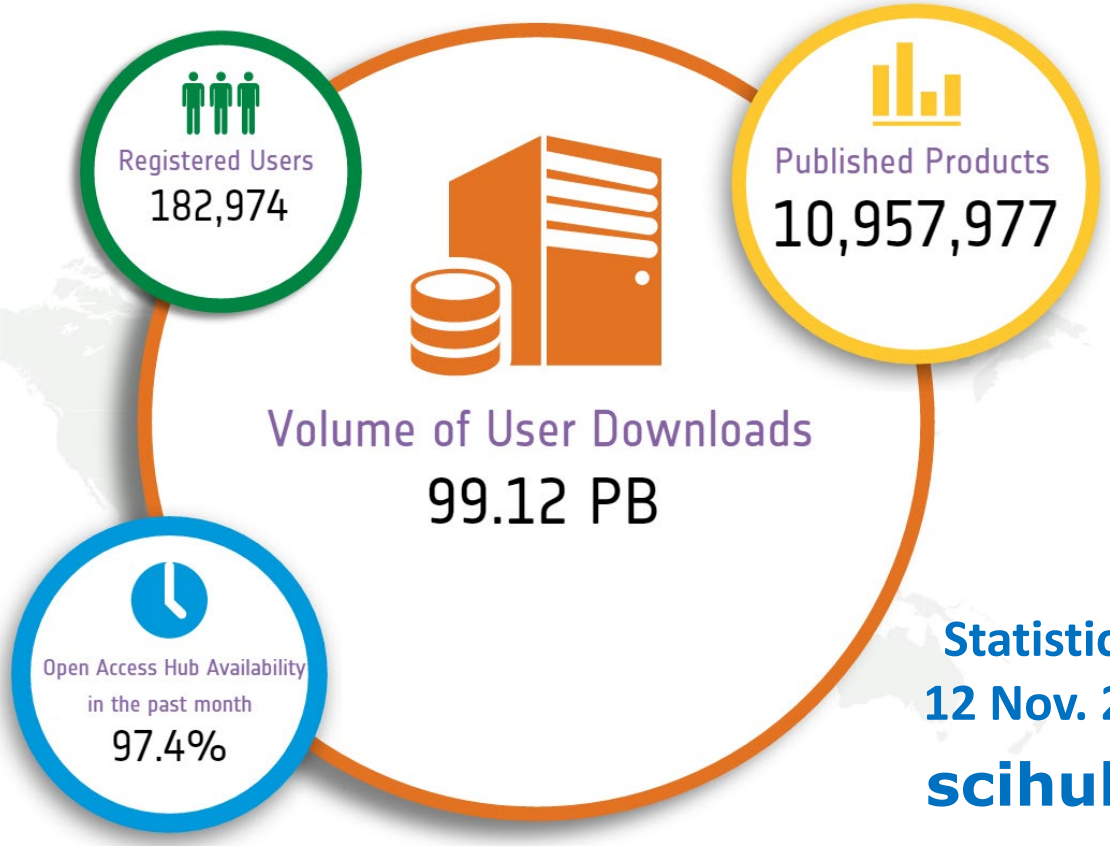
Registered Sentinel Users



Sentinel access through

- EU/ESA Copernicus Open Access Hub
- 6 Copernicus services
- 18 ESA Member State hubs
- NASA, NOAA, USGS, Geoscience Australia
- Commercial hubs

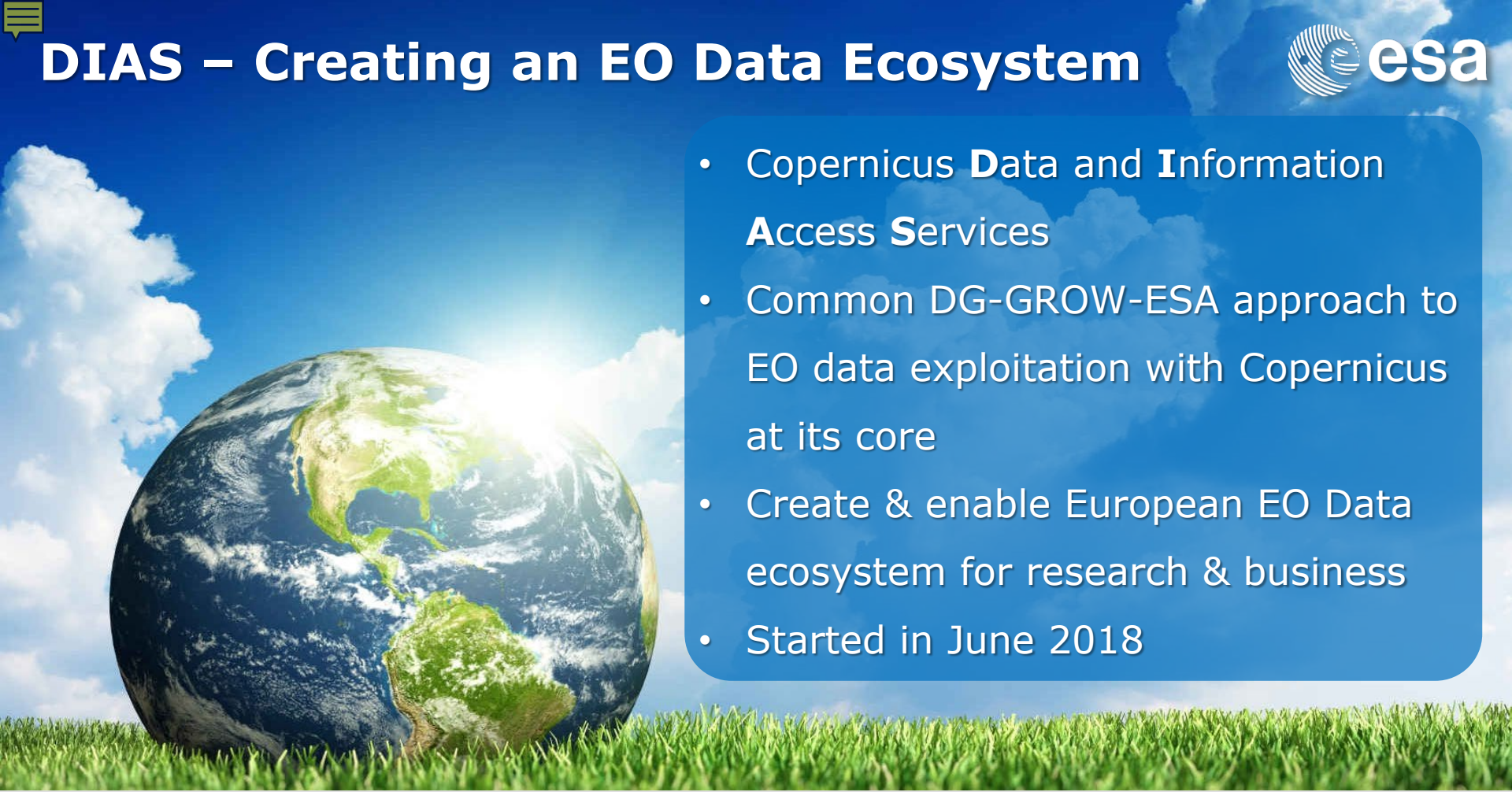
Sentinel Open Access Data Hub



Statistics on
12 Nov. 2018

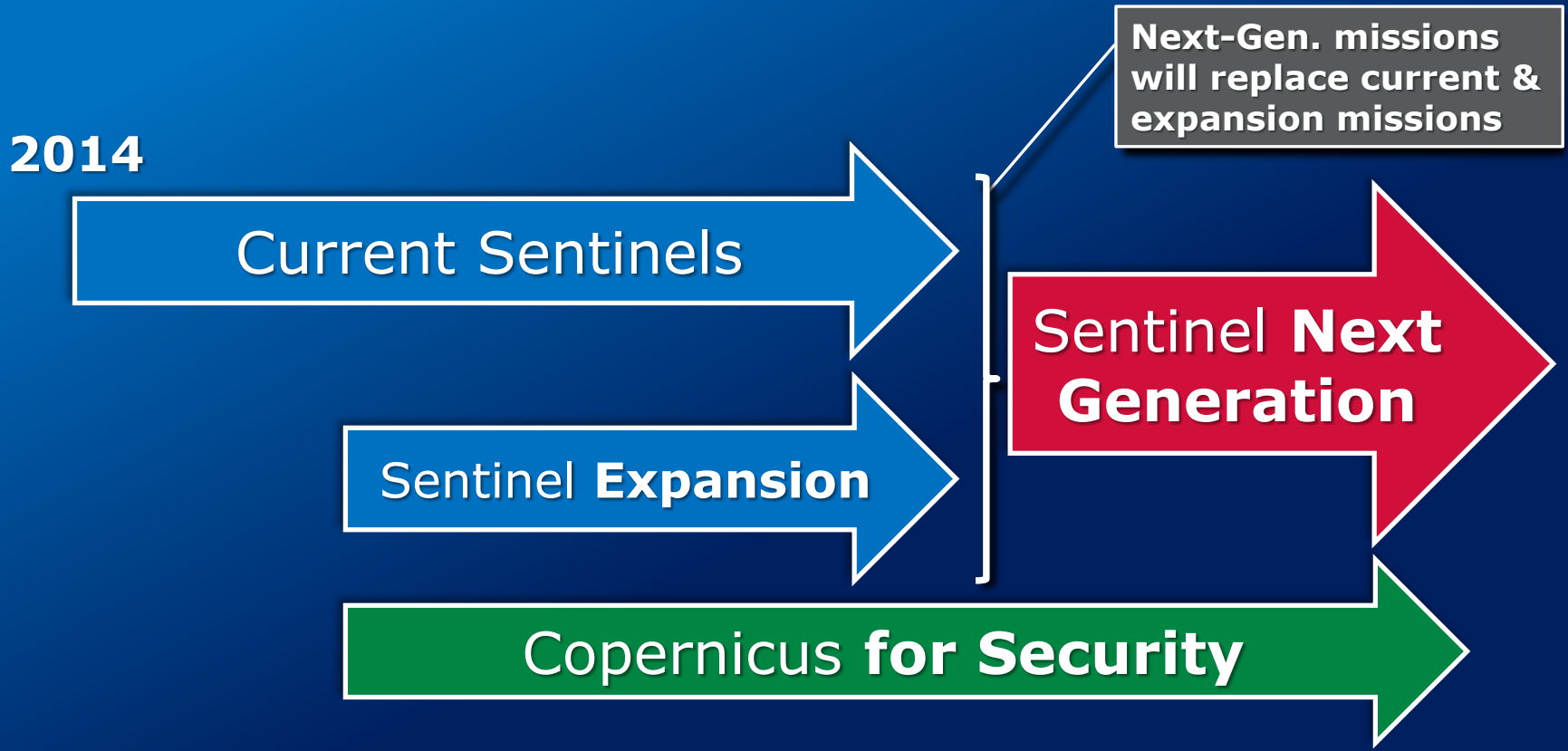
scihub.copernicus.eu

DIAS – Creating an EO Data Ecosystem



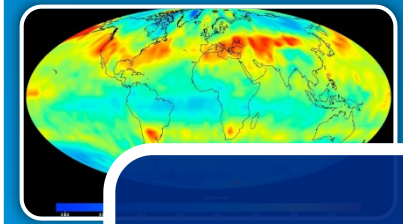
- Copernicus **D**ata and **I**nformation **A**ccess **S**ervices
- Common DG-GROW-ESA approach to EO data exploitation with Copernicus at its core
- Create & enable European EO Data ecosystem for research & business
- Started in June 2018

Copernicus Space Component Evolution

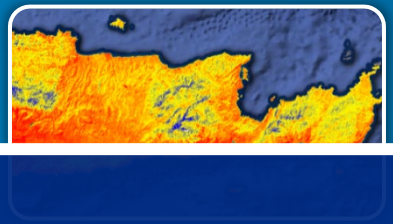


Copernicus 2.0

6 High Priority Candidate Missions



Anthropogenic CO_2 Monitor causes of Climate Change (CO_2 emissions)

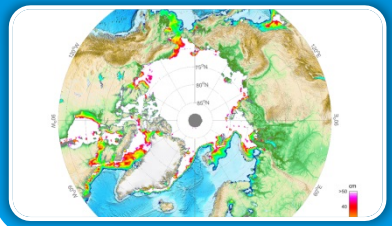


High Resolution Agriculture & Water Surface Temp. Productivity

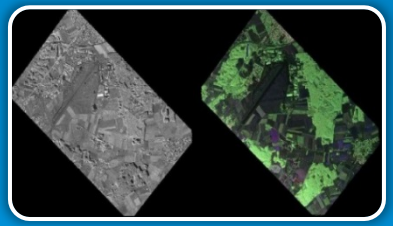
Phase A/B1 for new Sentinels ongoing

Imaging Spectroscopy Climate Change Topography (Arctic/Polar ice volume)

Hyperspectral Imaging Soil & Minerals, Forestry, Biodiversity



Sea Ice Conc. & SST Passive Microwave Imaging (Arctic situational awareness)



L-band SAR Soil Moisture, Vegetation & Ground Motion

Operational Systems are Game-Changers

Copernicus Services

- Land
- Atmosphere
- Marine Environment
- Climate Change
- Emergency Management
- Security

Security

Refugee Camp Monitoring

International Agreements

- EC leads cooperation with third countries and international organisations
- ESA implements technical cooperation activities with those partners

➔ Aim is mutual access to and enhanced use of Earth observation data

Fields of cooperation may be:

- Data acquisition and Quasi Real Time production (International Local Stations – currently not foreseen)
- Complementary collaborative data products and algorithms definition
- Core data product dissemination and access (e.g. international mirror sites)
- Development of innovative tools and applications
- Complementary external validation support activities

Existing Cooperation Agreements (4)

	**NASA**	Signed in February 2016. NASA intends to set-up a Sentinel data mirror site
	NOAA	Signed in March 2016. NOAA intends to use global Sentinel data for research purposes
	USGS	Signed in February 2016. USGS will focus on Sentinel-2 products hosting and distribution.
	**Geoscience Australia**	Signed in March 2016. GA, in collaboration with partner entities, intends to establish a Regional Copernicus Data Access/Analysis Mirror Site ('GA Data Mirror Site') to improve access to, and exploitation of, Sentinel data in the Australian, South-East Asia and South Pacific Region

living planet symposium

MILAN
13–17 May
2019

UNDERSTANDING THE EARTH SYSTEM

SPACE 4.0 AND EARTH OBSERVATION

BENEFITS FOR A RESILIENT SOCIETY

PUBLIC AND PRIVATE SECTOR INTERACTIONS

Deadlines

Session Proposals
17 June 2018

Abstracts
11 November 2018

Registration
April 2019

lps19.esa.int

Thank you for your attention!

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