Copernicus and WIGOS

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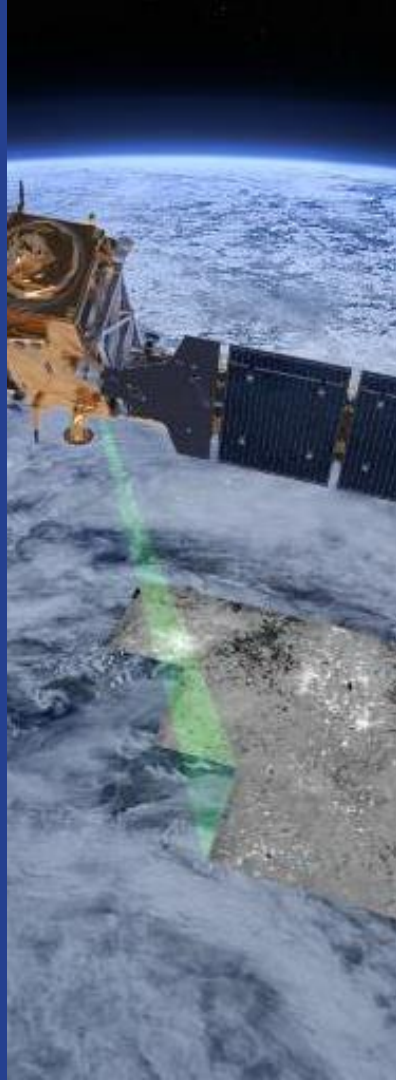

Space Component

The Copernicus Programme

- Copernicus is the European Union's Earth Observation Programme
- It is an operational programme comprising of satellite, in-situ observations and Services, underpinned by a ground segment and associated data distribution system
- It includes a fleet of satellite constellations (Sentinels) and a long term commitment
- It has a free and open data policy
- Through it's products and Services Copernicus is unique in addressing a broad range of applications and societal benefit areas in an operational context

But…

- Whilst the European Commission is a member (and currently Chair) of CEOS, it is not a member of CGMS – despite its operational mandate
- The European Commission is not a full Member of WMO

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European Commission

Space Strategy for the Europe

Space Component

- European Commission Publication Published in 2016
- Strong emphasis on International collaboration
- 4th Pillar: STRENGTHENING EUROPE'S ROLE AS A GLOBAL ACTOR AND PROMOTING INTERNATIONAL COOPERATION
- "the Commission will use EU space programmes to contribute to and benefit from international efforts…"

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THE SENTINELS- All contributions to WIGOS Components in Vision 2040

Space Compon

Sentinel 1 – **radar imaging**
All weather, day/night applications

✔ WMO

Sentinel 2 – **Optical imaging**
Land applications: urban, forest, agriculture,..

✔ WMO

Sentinel 3+6 – **Ocean and global land monitoring, high precisio**
ocean altimetry, OLCI, SLSTR

✔ WMO

Sentinel 4+5 – **Atmosphere composition monitoring, from a geostationary (-4) and a polar orbit (-5)**

✔ WMO

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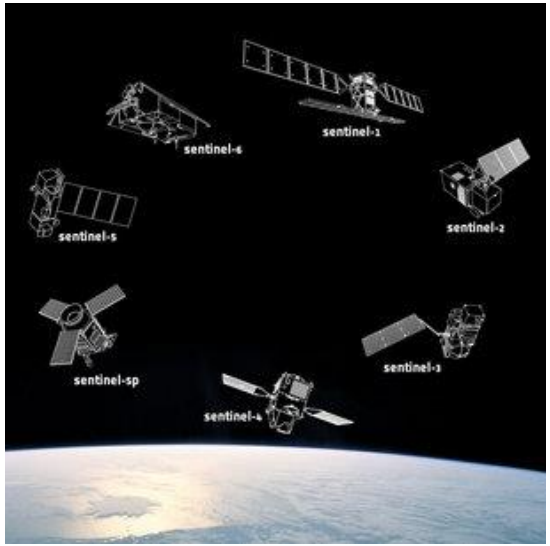
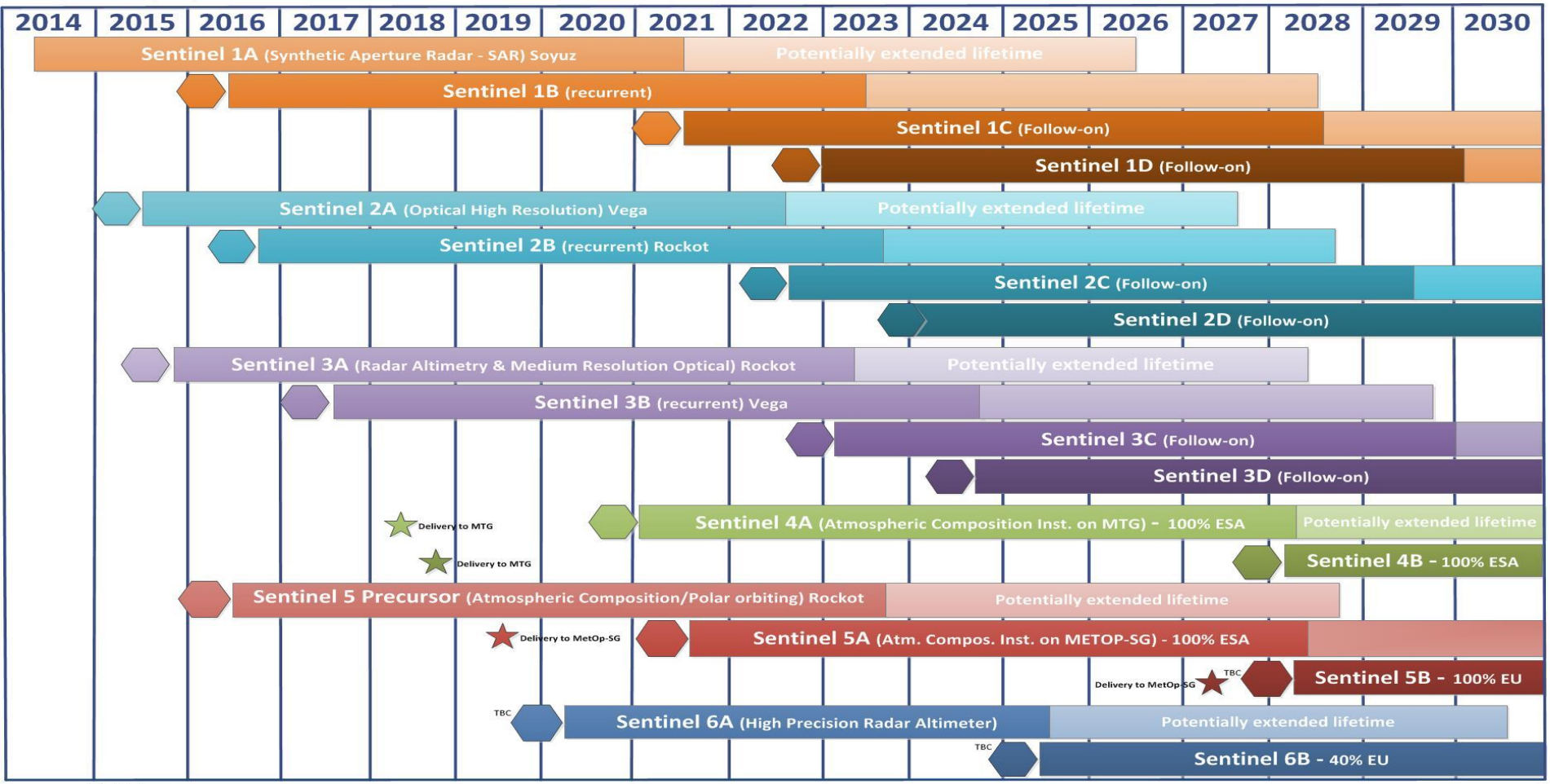
Space Component - Status

- **Six dedicated Sentinel satellites are in orbit: Sentinel 1A, 1B, 2A, 2B, 3A, 5P**
- **Two Sentinel constellations, Sentinel 1A and 1B and Sentinel 2A and 2B are now in orbit**
- **By the end of 2020, 8 Sentinel satellites will be in orbit, providing most of the data needed by the Copernicus services**



Status 07/09/2015

Copernicus Constellations Deployment Schedule



Why it all fits together?

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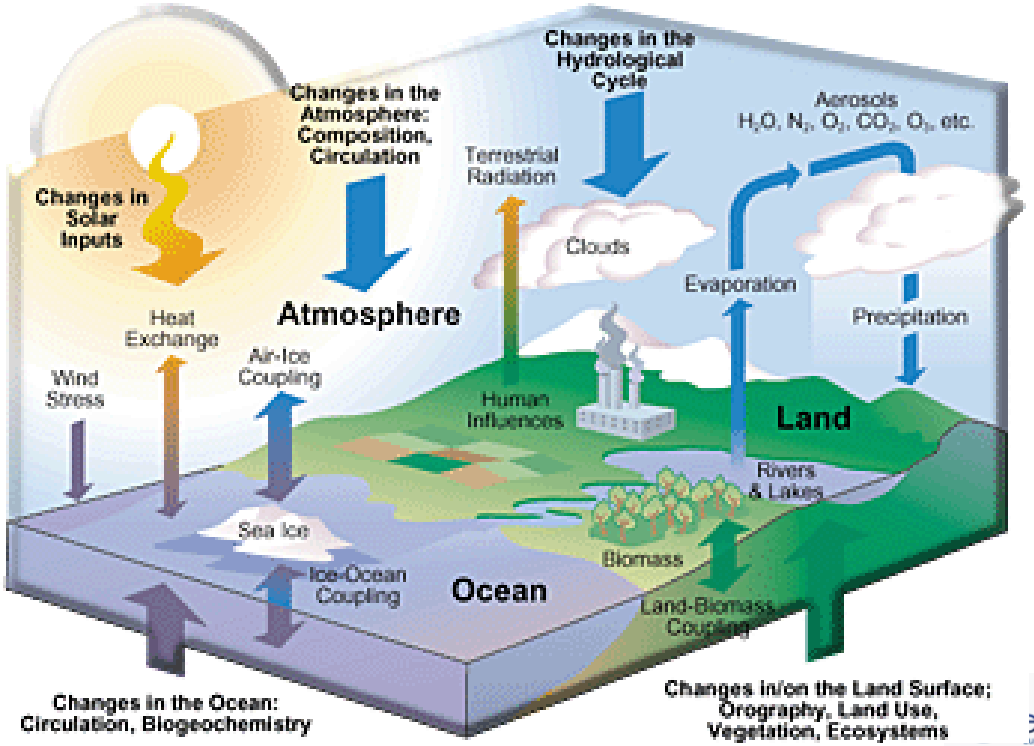
- Environmental monitoring is multi-faceted and requires multi-disciplinary observations/models



Why it all fits together? Copernicus services

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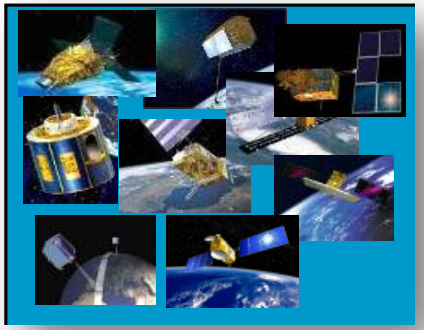
6 services use Earth Observation data to deliver …



Sentinels

Contributing missions

…added-value products

in-situ

European Commission

Earth Observation based ECVs in C3S

		GCOS
Atmospheric physics		
	Precipitation	4.3.5
	Surface Radiation Budget	4.3.6
	Water Vapour	4.5.3
	Cloud Properties	4.5.4
	Earth Radiation Budget	4.5.5
Atmospheric composition		
	Carbon Dioxide	4.7.1
	Methane	4.7.2
	Ozone	4.7.4
	Aerosol	4.7.5
Ocean		
	Sea Surface Temperature	5.3.1
	Sea Level	5.3.3
	Sea ice	5.3.5
	Ocean Colour	5.3.7
Land hydrology & cryosphere		
	Lakes	6.3.4
	Glaciers	6.3.6
	Ice sheets and ice shelves	6.3.7
	Soil moisture	6.3.16
Land biosphere		
	Albedo	6.3.9
	Land Cover	6.3.10
	Fraction of Absorbed Photosyntheti	6.3.11
	Leaf Area Index	6.3.12
	Fire	6.3.15

Heritage/coordination:

- ESA CCI(+)
- EUMETSAT SAFs
- Other Copernicus Services
- etc..

GCOS climate indicators:

- Global Surface Temperature
- Ocean Heat
- Atmosphere CO2
- Sea Level
- Ocean Acidification
- Sea Ice Extent : Arctic and Antarctic
- Glacier Change.

…

Requirements

Long term climate data records
Copernicus Sentinels
Third party missions (i.e. meteorology)
In-situ observations
Reanalyses
Modelling capabilities
Computing capabilities
Dissemination / access capabilities
…

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- Enhanced continuity of existing capacity is the overarching priority
- Conclusions on major gaps :
  - CO2 measurements to estimate anthropogenic emissions (top priority)
  - High-Resolution Thermal observations
  - Monitoring of sea ice and ice sheets in the polar region
  - Hyper-spectral measurements

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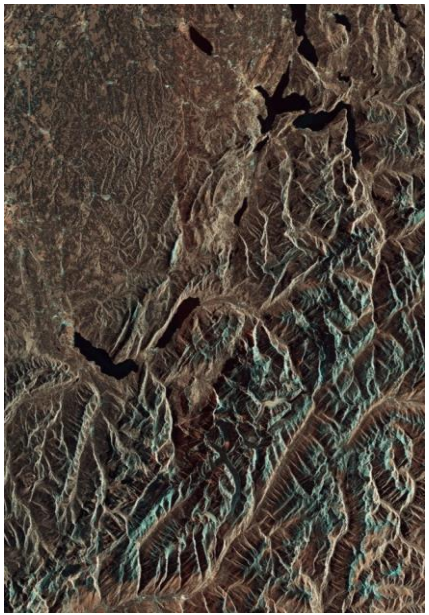
Copernicus big data - relevant to WIS

- Setting up of **Data Access and Information Services (DIAS):**
  - **Access to all Copernicus data and information virtually collocated with computing resources**
  - **Allowing Big Data analytics without the need to download the data and information**
  - **Allowing data fusion with non-EO data and information**
  - **Bring together all user communities (public authorities, research, commercial, ONG,…)**



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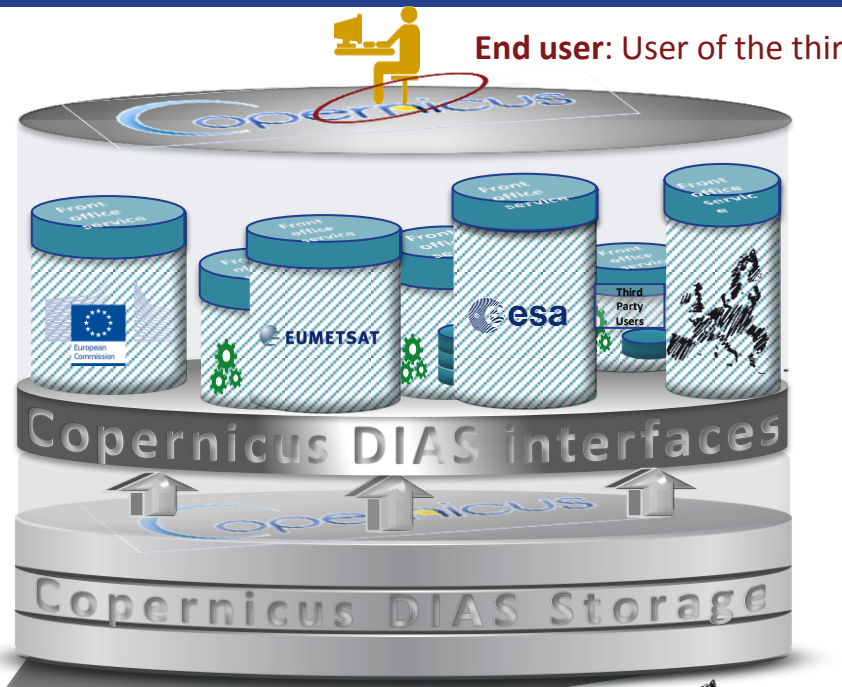
European EO Data ecosystem on DIAS

End user: User of the third-parties services

Funded by third-parties

DIAS funded



Third-party Users

Commercial or research users or initiatives (e.g. EO Market place,..)

EUMETSAT

Pathfinder projects
SAF

esa

EOEP-5 ("EO Science for Society")
Heritage Data (LTDP+), Earthnet
EarthWatch CCI, InCubed

EU Member States & particpating countries
National/commercial missions data access
Sentinel Collaborative Ground Segment

Copernicus Services & user uptake
Copernicus Data & Information Access Services
Research and Innovation Projects (H2020)
Open Science Cloud & GEOSS Infrastructure

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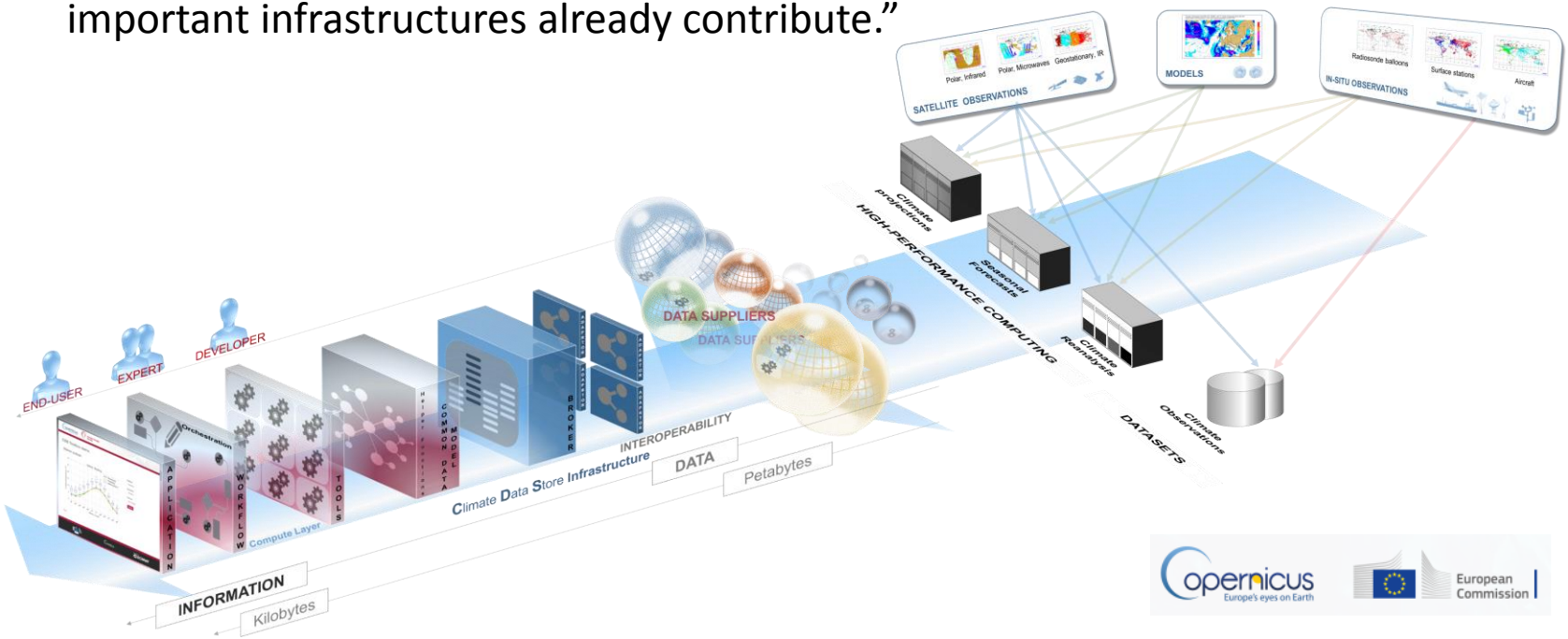
Service specific link to WIS: C3S

"The C3S interface offers three components: a web portal, a catalogue and a broker. The system will also interoperate with other systems, such as the WMO Information System (WIS) to which important infrastructures already contribute."



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CONCLUSIONS

- Copernicus contributes to the vision of WIGOS 2040

- Copernicus key words relevant to WIGOS:
  - Earth Observation programme
  - Earth System monitoring services
  - Operational
  - Long term commitment
  - Full Free Open
  - Data access and dissemination
    - Big data, links with the WIS, etc.