

Earth Observation at ESA in the Coming Decades

UK National Earth Observation Conference
Birmingham, 5 September 2018

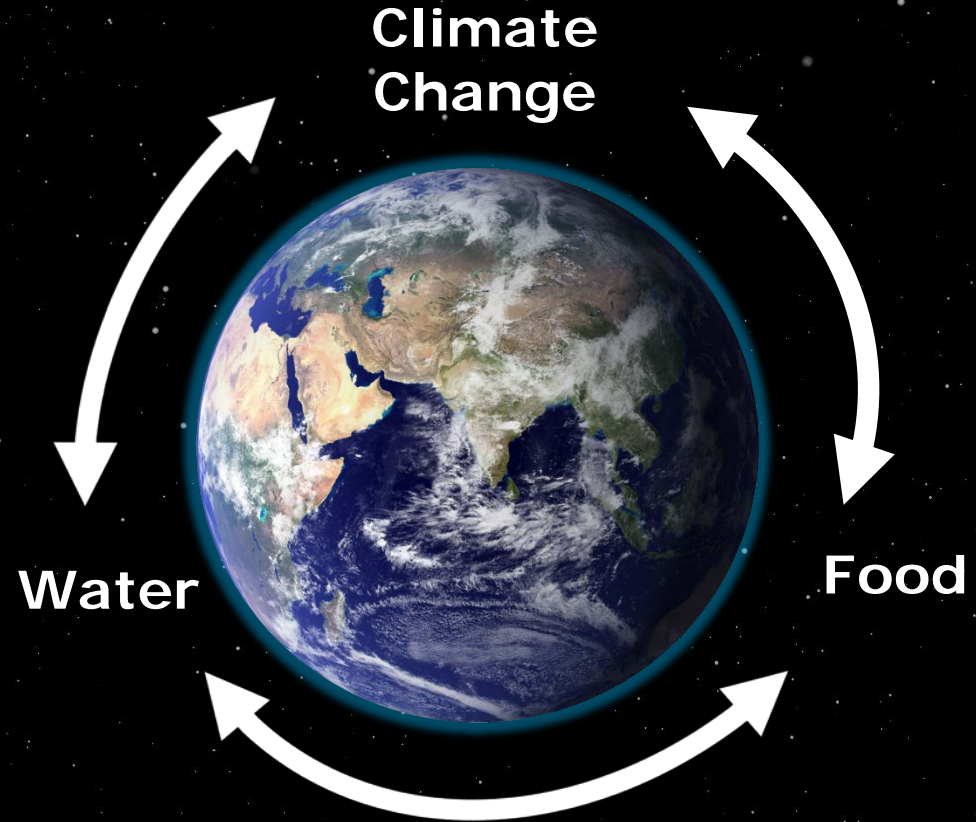
Josef Aschbacher, ESA
Director of Earth Observation Programmes



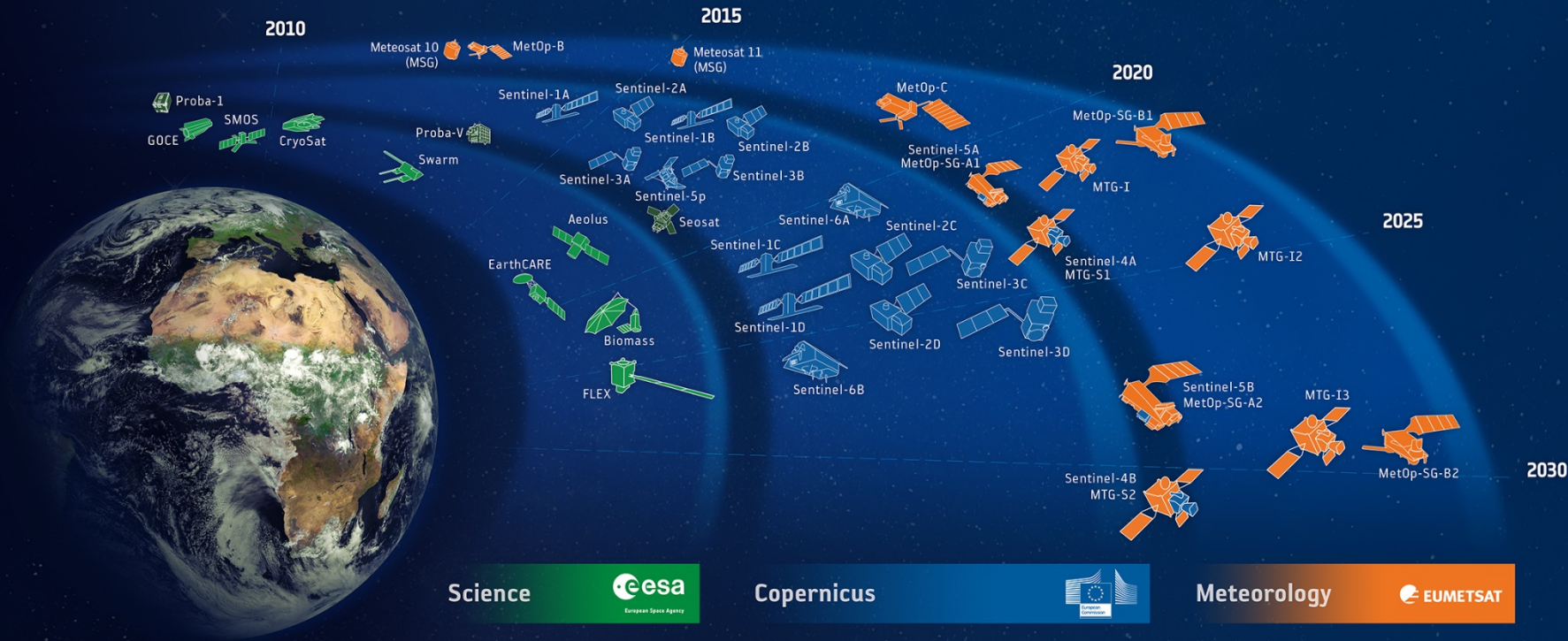
The 21st Century Societal Challenges



EO helps
humankind to
address
21st century
challenges

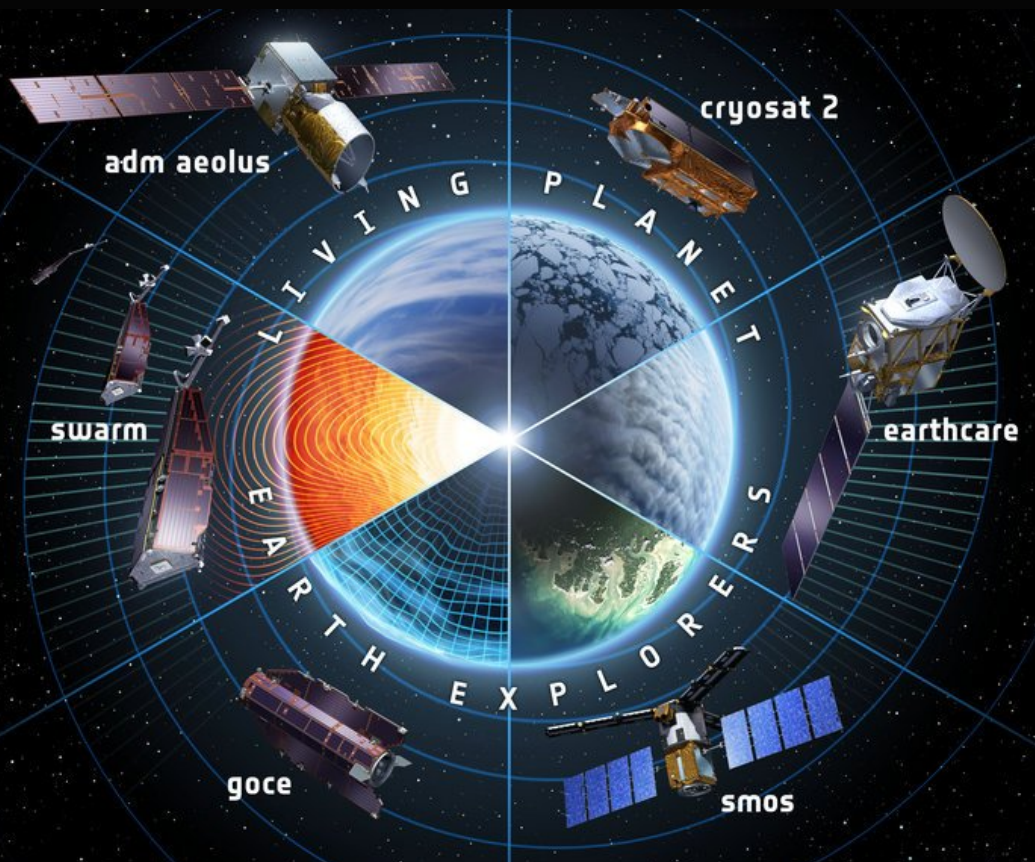


ESA-DEVELOPED EARTH OBSERVATION MISSIONS



26 satellites in development, 14 in operations

Earth Explorers



GOCE 2009 – 2013

SMOS 2009 – Present

Cryosat 2010 – Present

SWARM 2013 – Present

Aeolus launched 2018

EarthCARE 2020

Biomass 2021

FLEX 2022



Aeolus Launch 22 August 2018



**Aeolus Prime Contractor :
Airbus DS - UK**



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)



FULL, FREE AND OPEN
ACCESS TO DATA

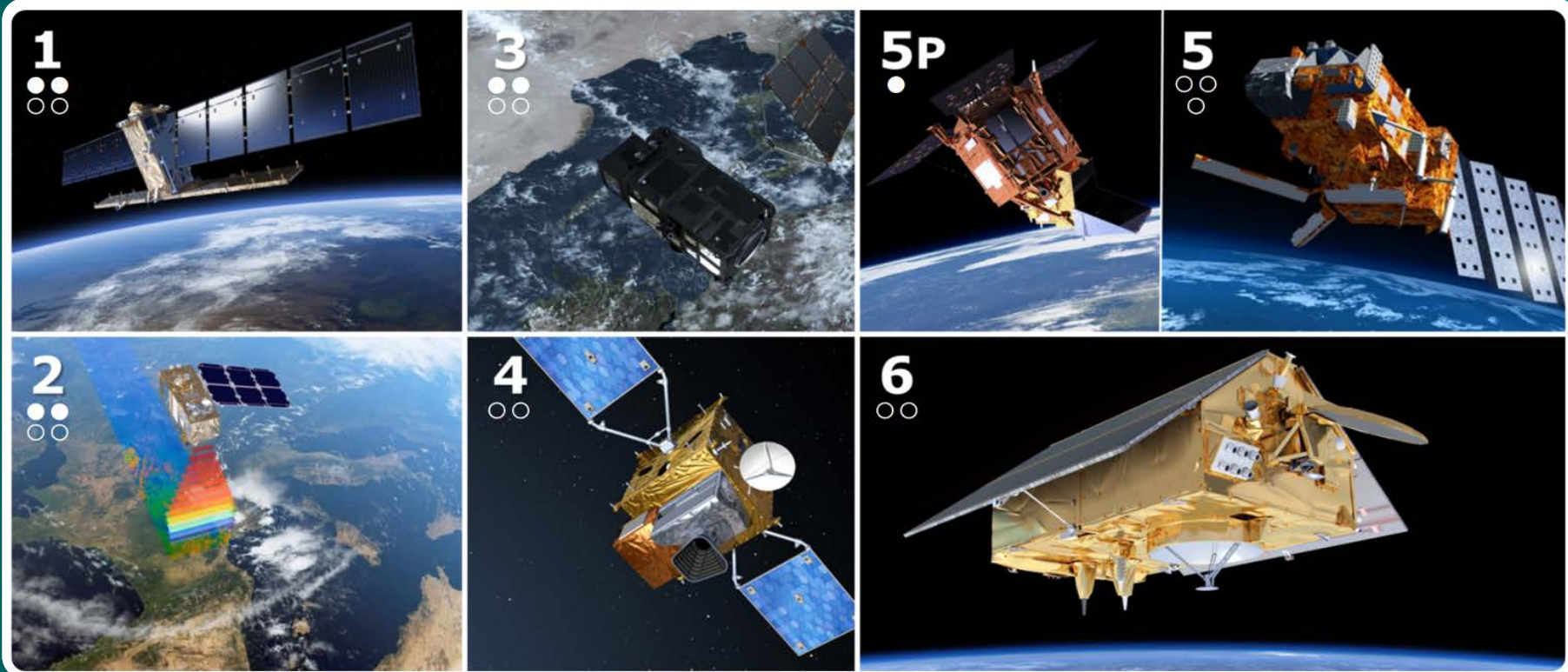


-  ATMOSPHERE MONITORING
-  MARINE ENVIRONMENT MONITORING
-  LAND MONITORING
-  CLIMATE CHANGE
-  EMERGENCY MANAGEMENT
-  SECURITY



The Big Data Revolution

Copernicus is the largest producer of EO data in the world

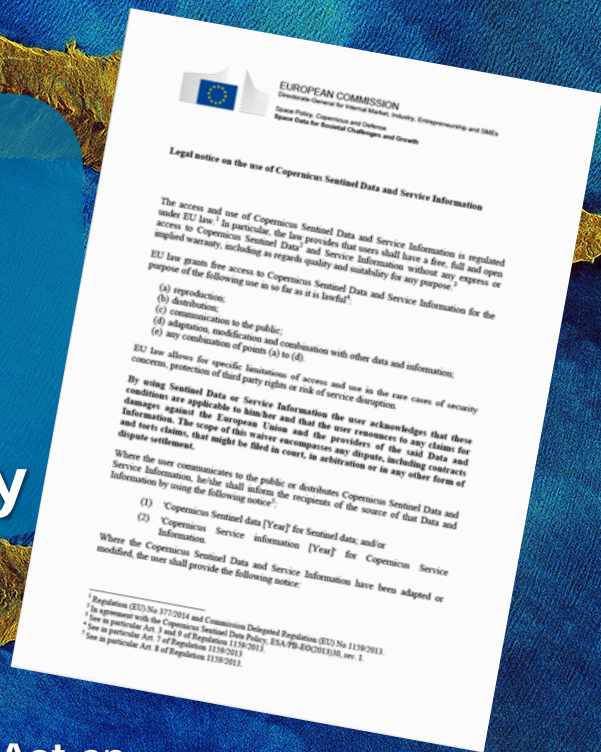


Copernicus Sentinel Data Policy



Sentinel data are available:

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



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



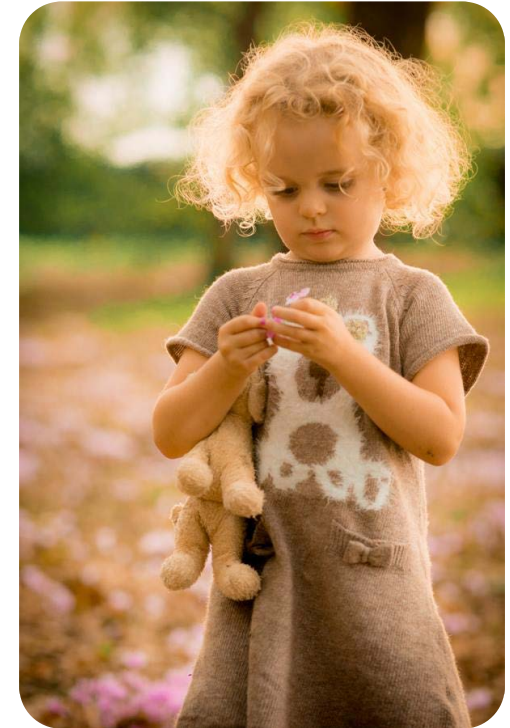
From Green to Brown in One Month



Sentinel Open Access Data Hub



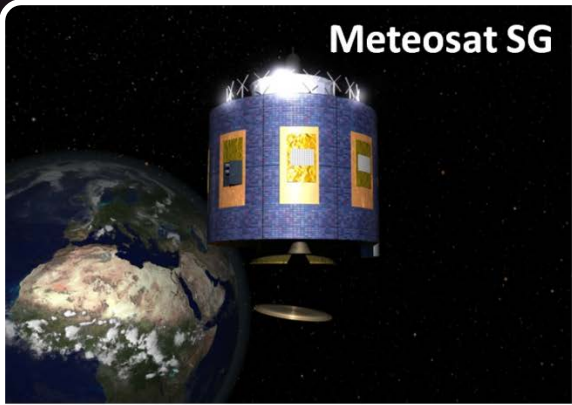
as of 31 August 2018



New Meteorological Systems



Meteosat SG



MetOp



Meteosat TG



MetOp SG

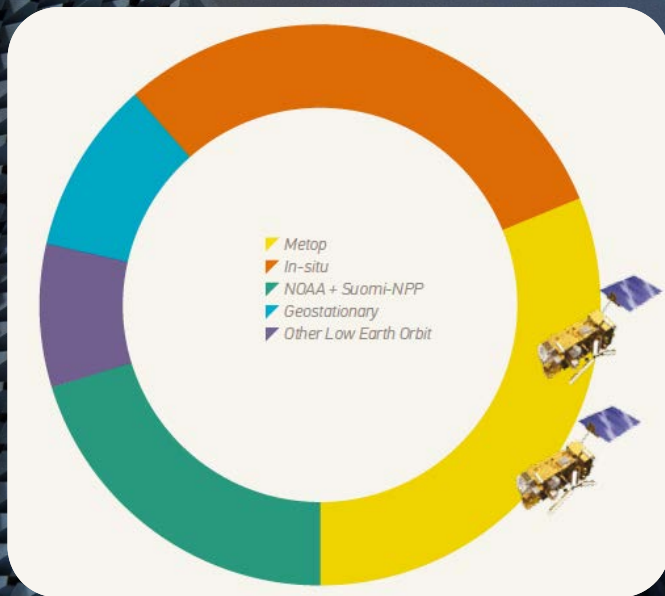


< Current Systems

< Post-2020 Systems



Meteorology: Protecting Lives & Assets



NWP Forecasting Accuracy Contributions

MetOp A+B: 44%

NOAA+NPP: 29%

UK Met Office, 2015



United Kingdom and ESA Earth Observation

- UK biggest contributor to ESA EO Programmes at Ministerial Council 2016
- UK largest contributor to “Global Monitoring for Essential Climate Variables” by far
- Leading UK role in Aeolus mission: Prime contractor ADS-UK
- ESA-ECSAT Establishment at Harwell with ESA Climate Office
- Close cooperation in the area of New Space



Brexit Implications

No overall concerns for UK funding to **ESA EO programmes**

Copernicus

Space component is EU/ESA co-funded.

No (major) EU funding allowed to UK based companies in case the UK does not contribute to EU Copernicus budget.



- Primarily a procurement issue. ESA funding typically used for prototype satellite, EU funding for recurrent units and operations.
- Current Sentinel operations contracts: Excellent UK expertise. Operations in UK depends on UK role in EU Copernicus programme.

ESA EO Strategy 2015 largely valid, but

- Significant evolution of ESA EO landscape (Copernicus, top-class Earth Explorers and met missions)
- Increasing number of excellent EO missions in ESA MSs (public, commercial)
- NewSpace revolution, especially in EO

+ feedback from 12 June Head of Delegation WS

lead to the need for A NEW ESA EO VISION

Has to particularly account for ...

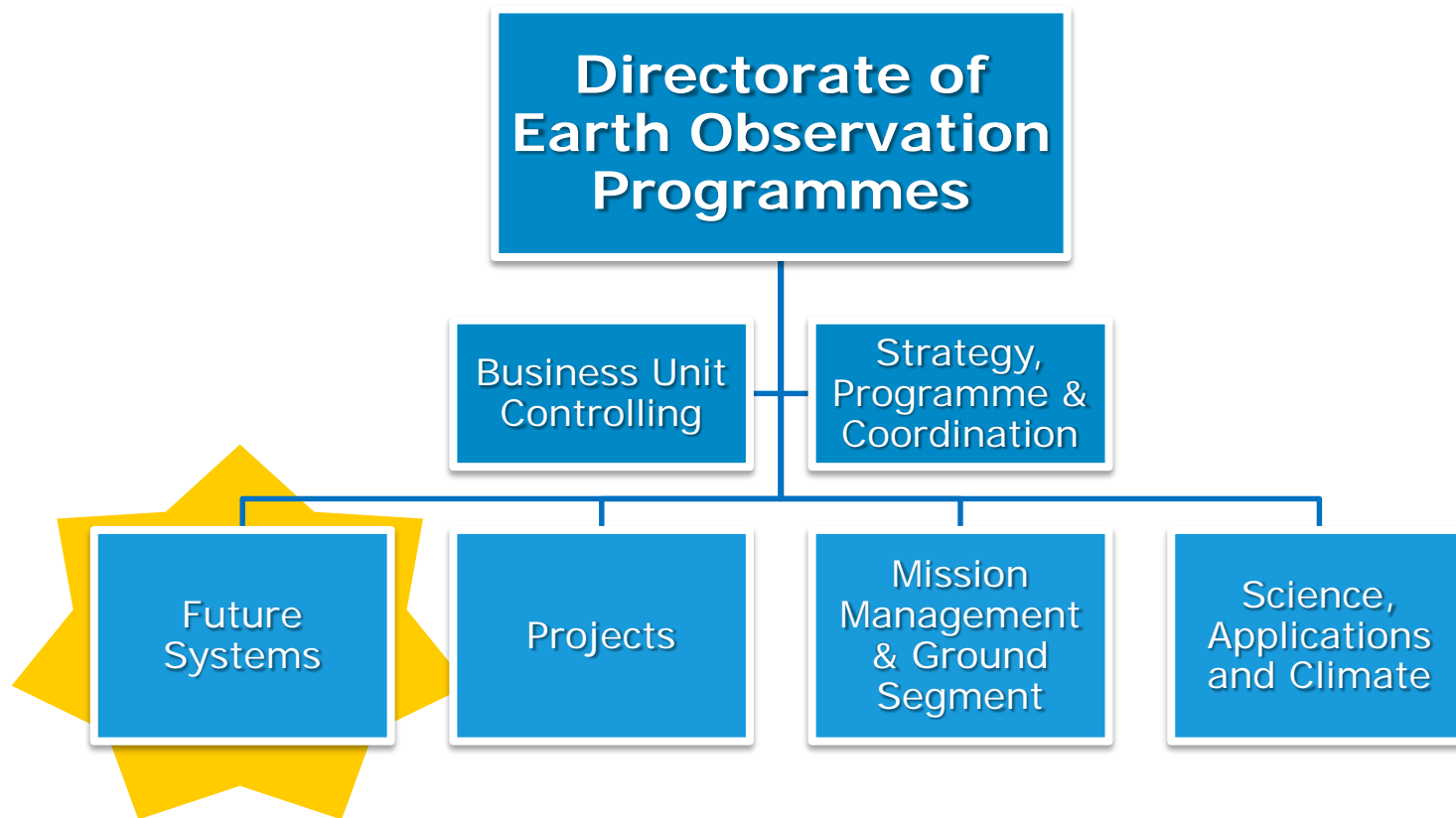
Member State &
Commercial Missions

NewSpace

European EO has to keep evolving

- ESA-internal: D/EOP reorganisation in 2017
- Attractive EO package at CM19 for
ESA Member States

New EOP Structure



Transformative Technologies



7B Phones

SmallSats

IoT

Big Data

AI - ML - DL

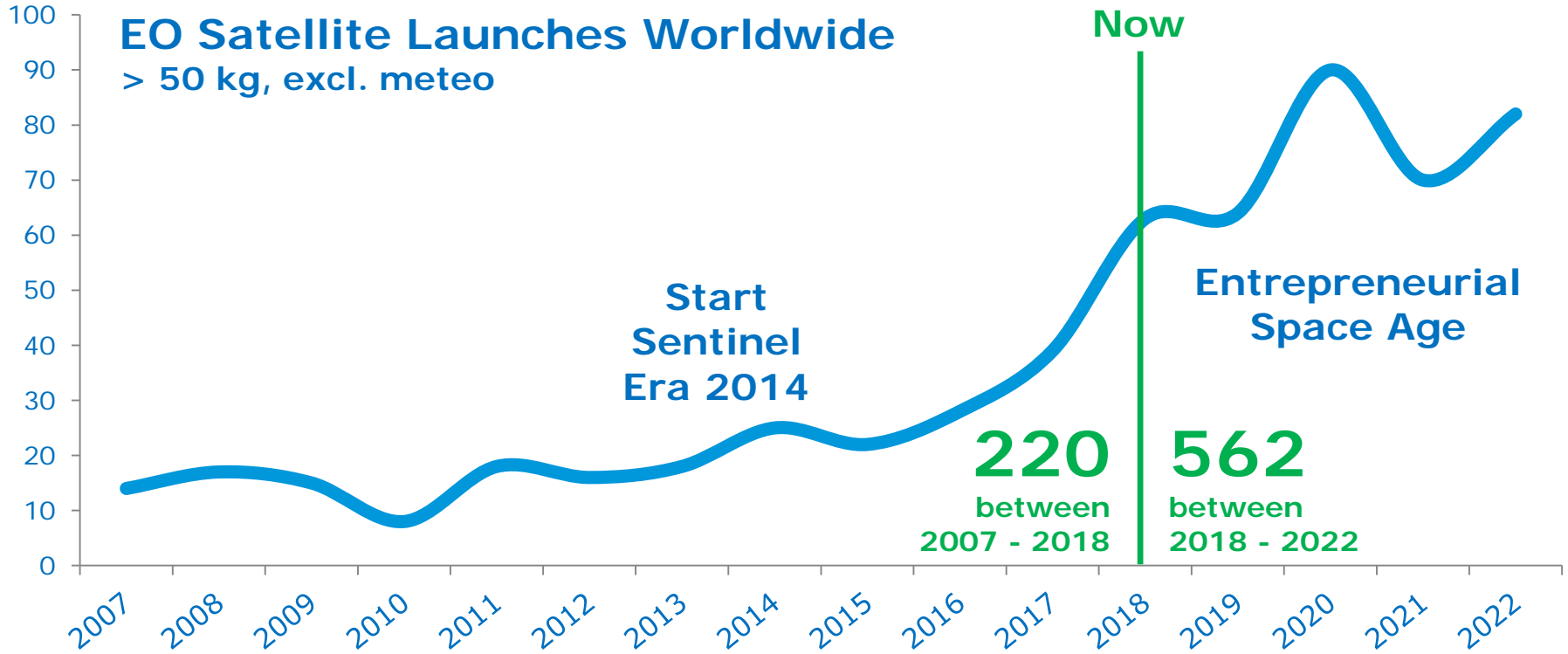
Exploitation Platforms

Cloud Computing

Crowdsourcing



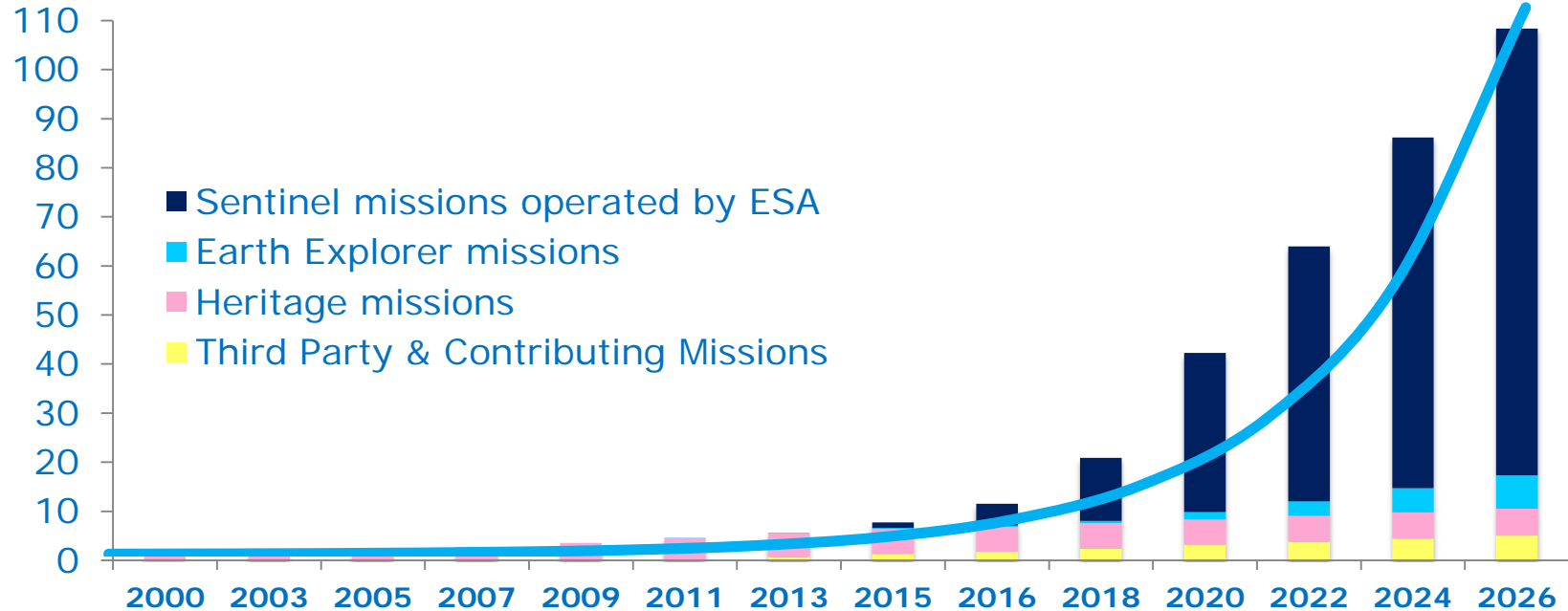
More Eyes in the Sky



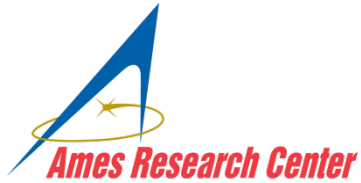
Source: Euroconsult Database, 2017

Big Data Revolution

ESA EO Data Archive Petabyte



Learning from Silicon Valley



New ESA Initiative

Shaping the Future of EO

Leveraging the Data &
Tech Revolutions



In one sentence

“Opening ESA
to disruptive
innovation
in EO”

Explore



Non-EO Technologies
Artificial Intelligence
Future Architectures

Inspire



Open Work Space
Digital Education
Hackathons
Challenges

Connect



New Actors
Startups Innovators
Ecosystems
Internal/External

Invest



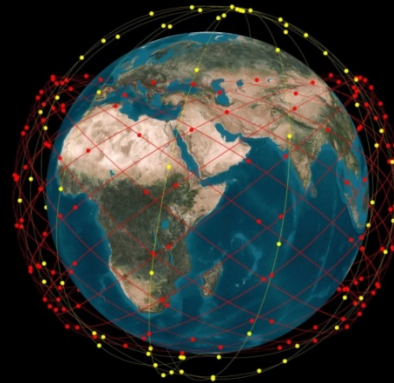
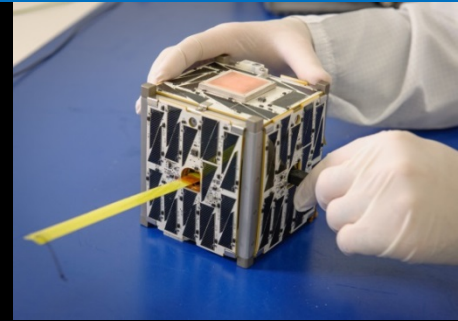
PPPs
New Joint Ventures
InCubed Programme

Exploring New Observation Platforms

Through Innovative Concepts such as ...



Small Sat



Mega-constellations

Defining a CM19 Package to meet future challenges

EO Activities proposed for CM19



Packaging into CM19 programme proposals to be done with PBE0

- Copernicus 2.0
- Implementation of Earth Explorer 9, complete Altius
- Science and technology preparation, system architecture
- Small-sat / opportunity missions
- New EO services for society (resilient society, civilian security)
- Smart data access and analytics (AI, ML, blockchain, etc.)
- PPPs for European EO growth

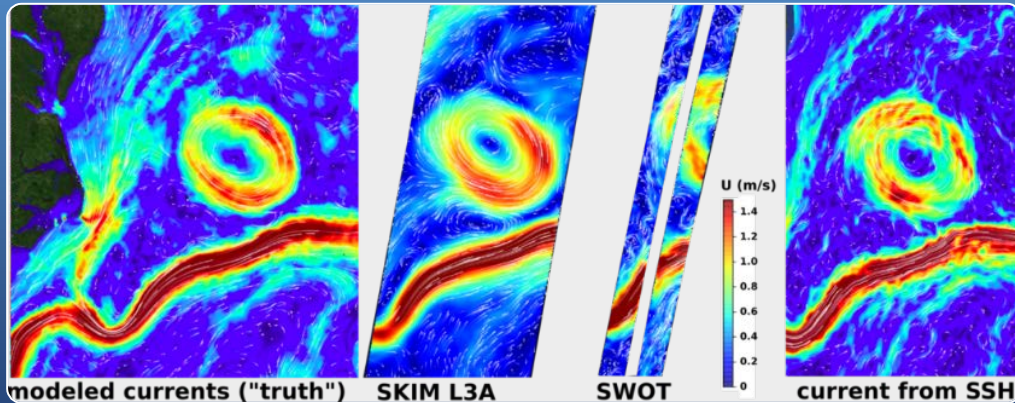
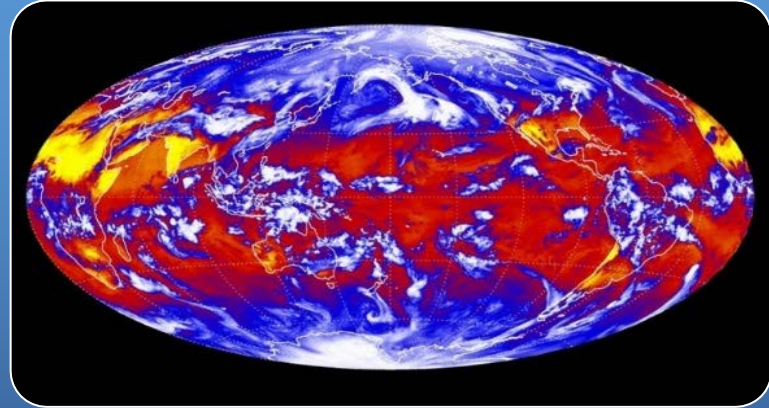


Implement Earth Explorer 9 ...



FORUM

Greenhouse Effect / Climate Change



SKIM

Ocean Surface Currents

... and continue operations of orbiting Earth Explorer missions



Copernicus 2.0



2020 to 2027

- Building on the Success of Copernicus



Continue current observations
(Sentinel 1-6)

Satisfy emerging policy & user needs
(Sentinel 7+)

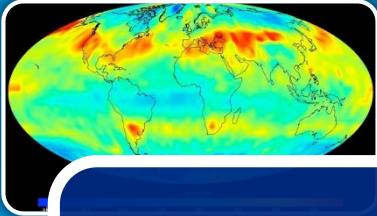
→ Copernicus Long Term Scenario

- Generated in close coordination of EC – ESA – EUMETSAT

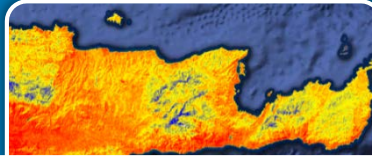
→ Joint Operations Concept of ESA & EUMETSAT



6 High Priority Candidate Missions



Monitor causes
Climate Change

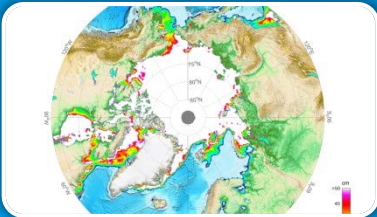


Agriculture &
Urban Mgmt

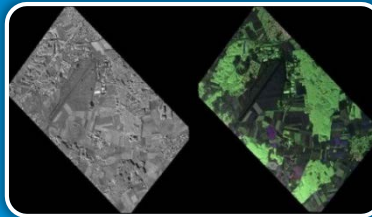
Phase A/B1 for new Sentinels ongoing



Soil



Sea Ice Concentr.
& Sea Surface
Temp.



Soil, Vegetation &
Ground Motion

Thank you for your attention!

www.esa.int

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