

# → 7th ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

4–9 September 2017 | Szent István University | Gödöllő, Hungary

ESA EO Science for Society Programme

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Science, Applications and Climate Department  
ESA – European Space Agency  
Frascati, Italy





# 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.**”

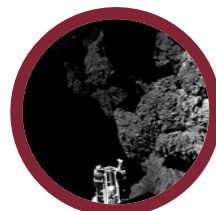
Article 2 of ESA Convention



# Activities



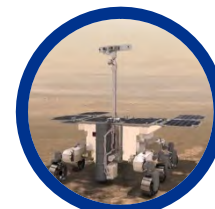
ESA is one of the few space agencies in the world to combine responsibility in nearly all areas of space activity.



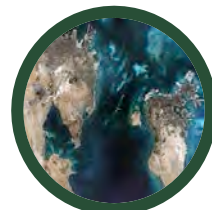
space science



human spaceflight



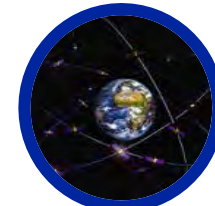
exploration



earth observation



launchers



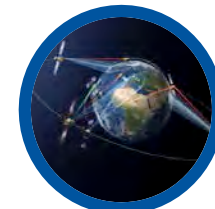
navigation



operations



technology



telecommunications



# Member States

## 22 ESA Member States:

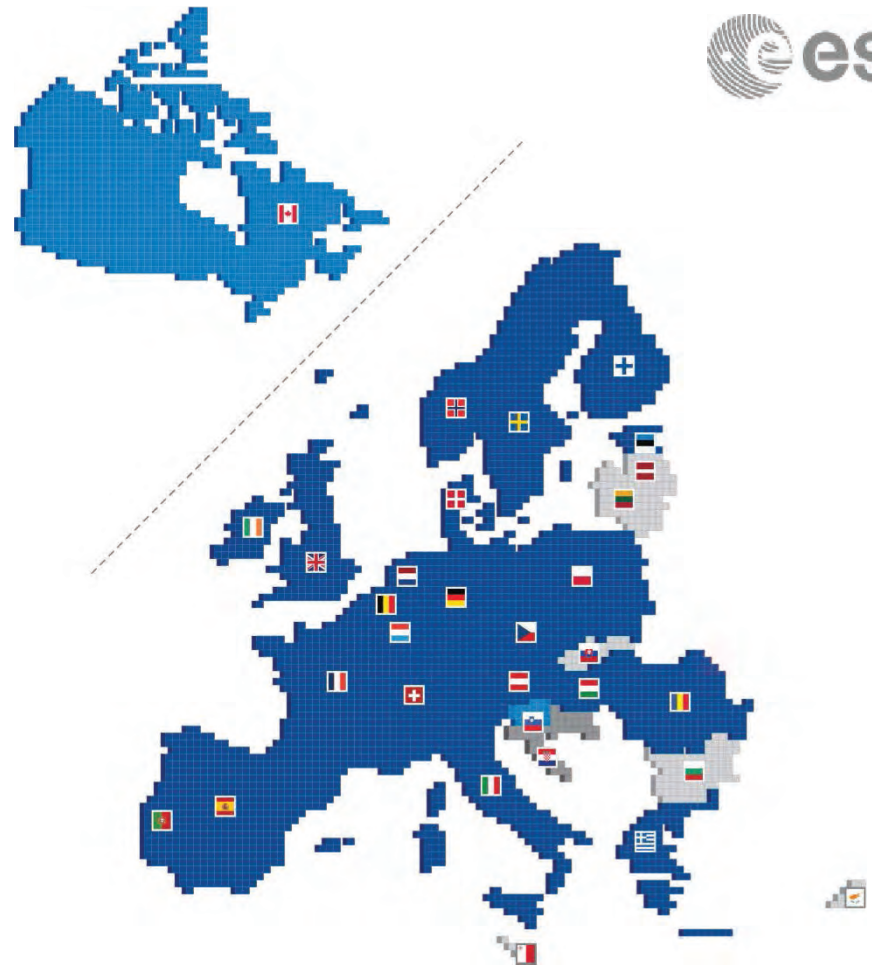
- 20 states of the EU (AT, BE, CZ, DE, DK, EE, ES, FI, FR, IT, GR, HU, IE, LU, NL, PT, PL, RO, SE, UK)
- Non-EU: **Norway** and **Switzerland**

## Cooperation Agreements with ESA:

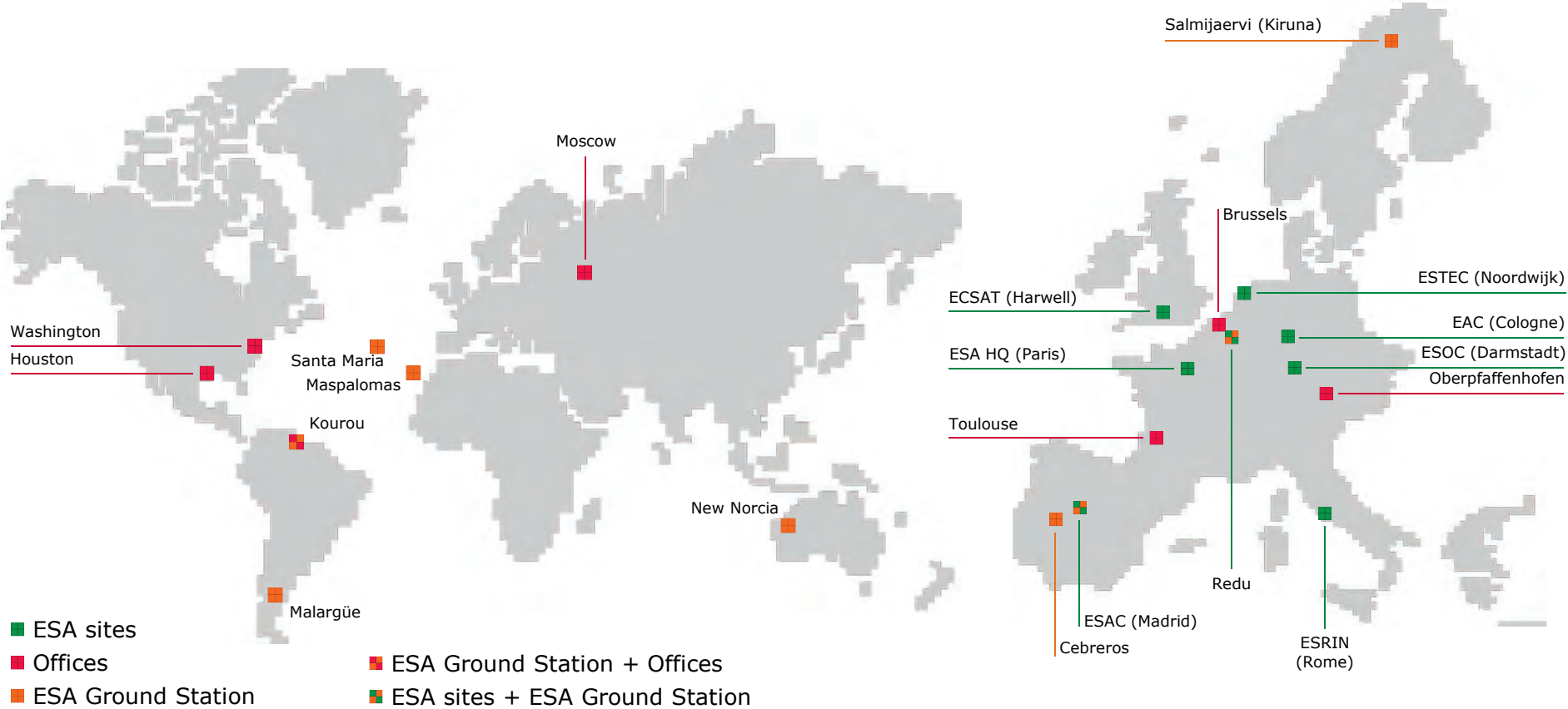
- **BG, CY, LV, LT, MT** and **SK**
- Discussions are ongoing with **Croatia**

**Slovenia** is an Associate Member

**Canada** takes part in some programmes under a long-standing Cooperation Agreement



# ESA's locations

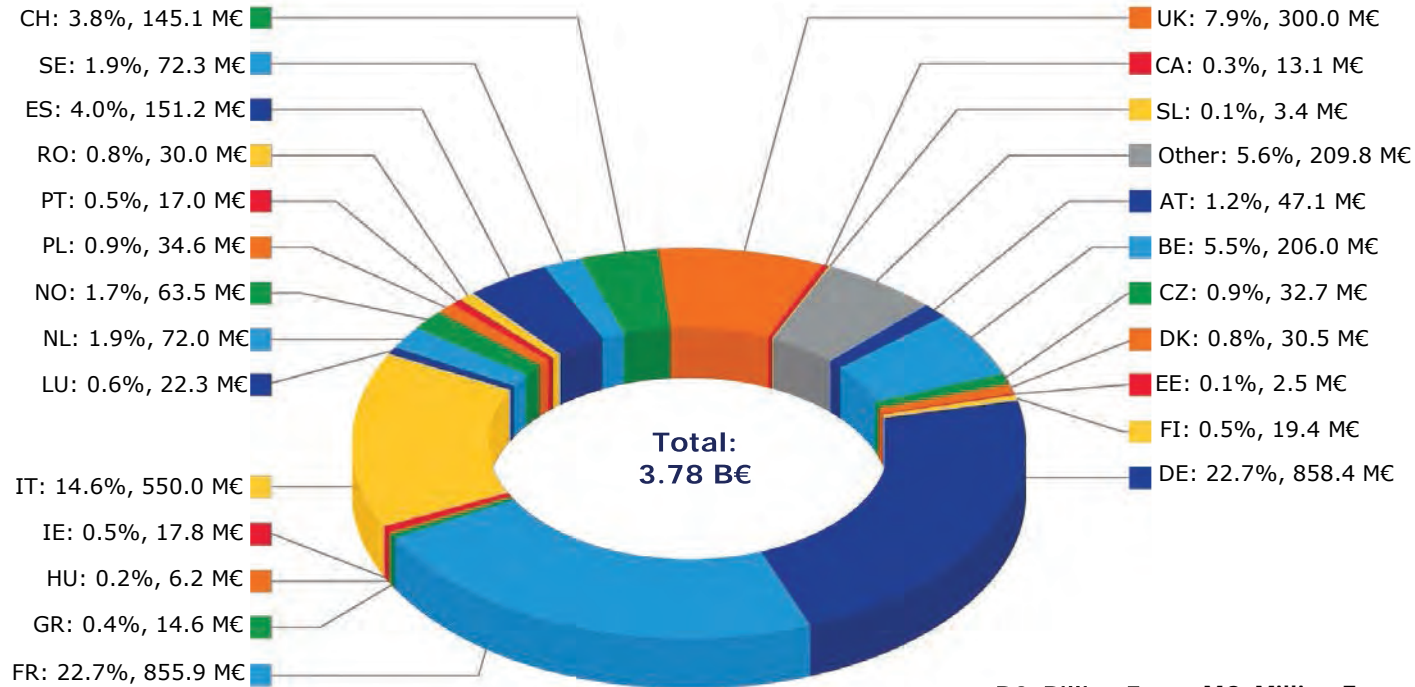




# ESA budget for 2017: 5.75 B€

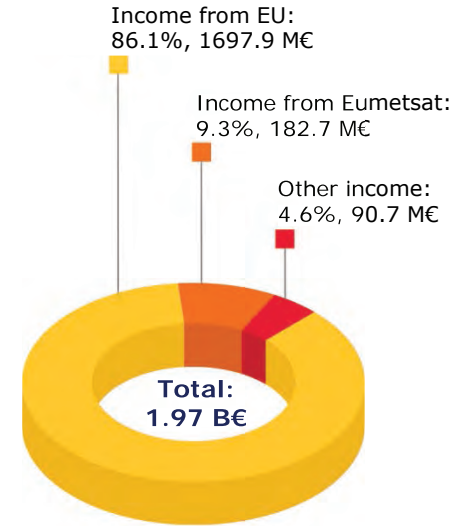


## ESA Activities and Programmes



B€: Billion Euro M€: Million Euro

## Programmes implemented for other institutional partners



# ESA budget for 2017: by domain



Navigation\*  
17.6%, 1,010.8 M€

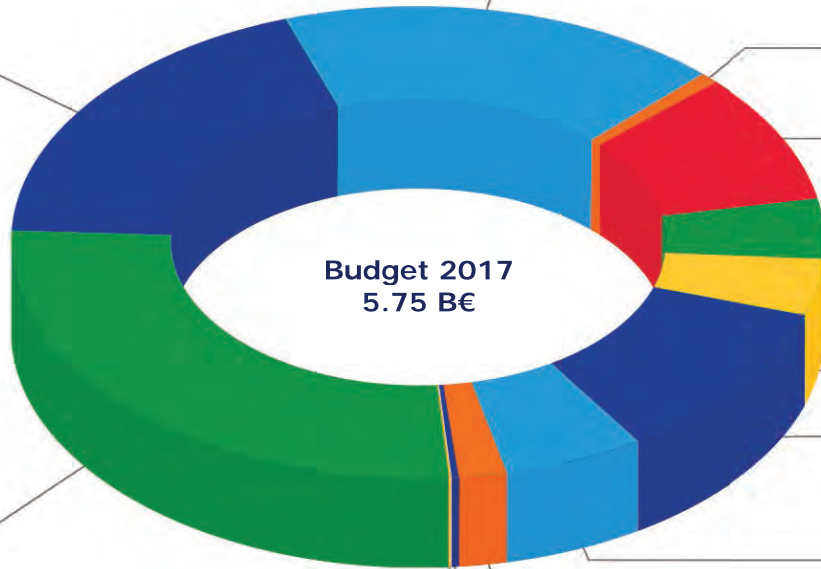
Launchers\*  
18.9%, 1,088.4 M€

**B€: Billion Euro**  
**M€: Million Euro**

**\*includes programmes implemented for other institutional partners**

Earth Observation\*  
26.9%, 1,543.3 M€

European Cooperating States Agreements  
0.1%, 5.5 M€



Prodex  
0.8%, 47.2 M€

Space Science  
8.9%, 513.1 M€

Basic Activities  
4.1%, 234.8 M€

Associated with General Budget  
3.9%, 222.3 M€

Human Spaceflight & Robotic Exploration  
11.0%, 633.0 M€

Telecom & Integrated Applications\*  
5.6%, 319.0 M€

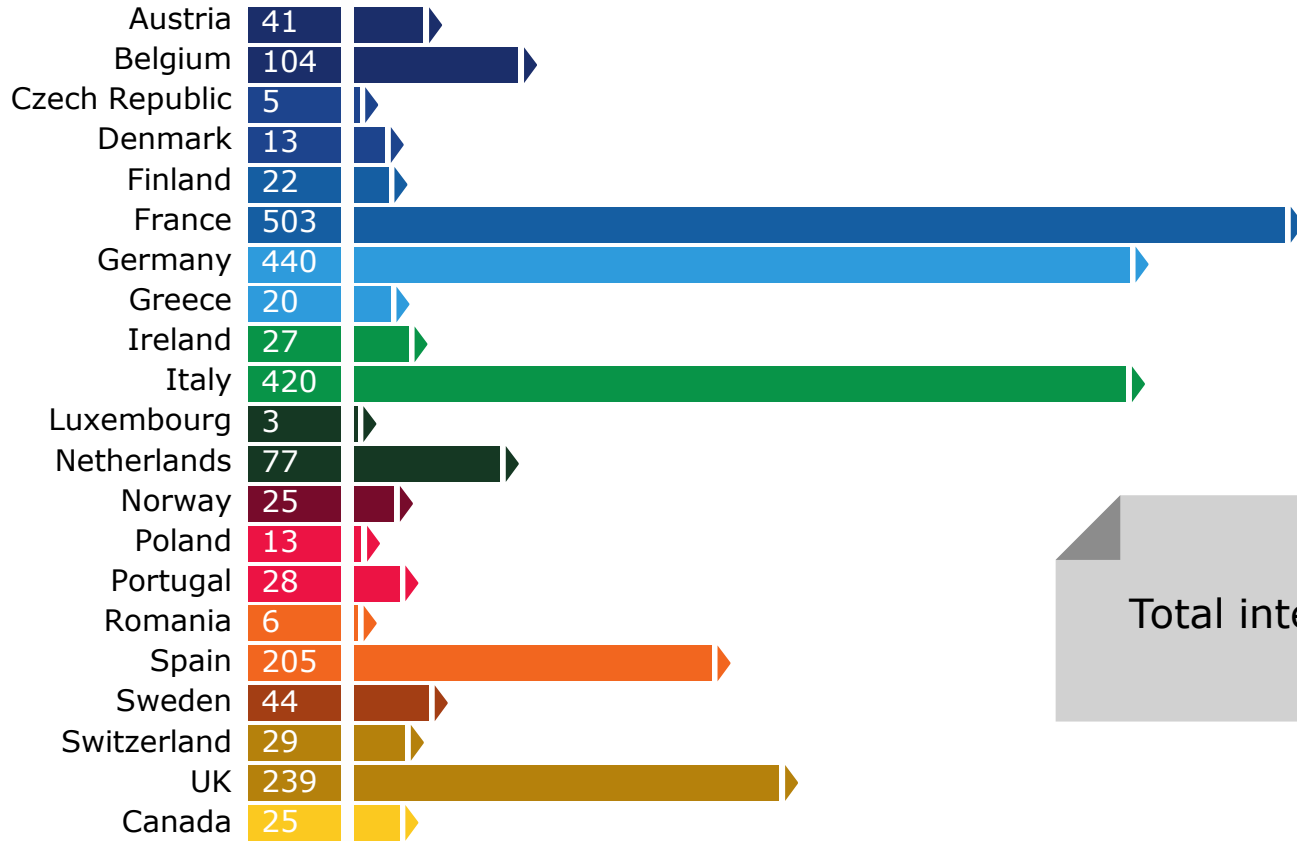
Technology Support\*  
2.0%, 114.3 M€

Space Situational Awareness  
0.3%, 15.1 M€





# Staff by nationality in 2016



Total international staff: 2289





About 85% of ESA's budget is spent on contracts with European industry.

## ESA's industrial policy:

- Ensures that Member States get a fair return on their investment;
- Improves competitiveness of European industry;
- Maintains and develops space technology;
- Exploits the advantages of free competitive bidding, except where incompatible with objectives of the industrial policy.

# Earth Observation at ESA



# Meteosat-1 (1977)



ERS-1 (1991-2000)  
ERS-2 (1995-2011)







Envisat (2002–2012)



# The Home of (Much of) ESA EO

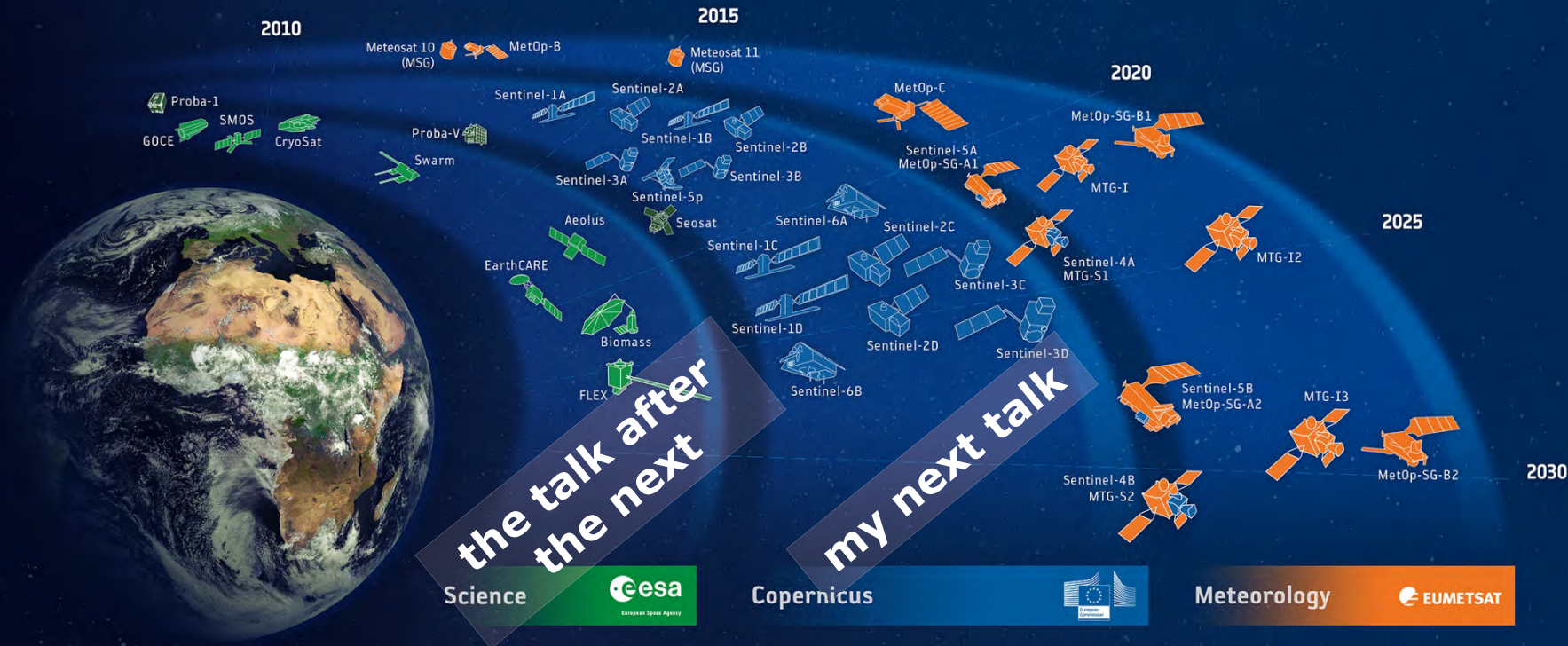


**ESRIN**, in Frascati, Italy, is ESA's centre for Earth Observation where operations and exploitation of Earth Observation satellites are managed.

The world's largest database of environmental data for both Europe and Africa is managed from ESRIN.



# ESA-DEVELOPED EARTH OBSERVATION MISSIONS



the talk after the next

my next talk

Science

Copernicus

Meteorology

# ESA's Earth Observation Envelope Programme (EOEP)



eo science for society

"EOEP-5 Block 4" also known as "EO Science for Society"

Objectives:

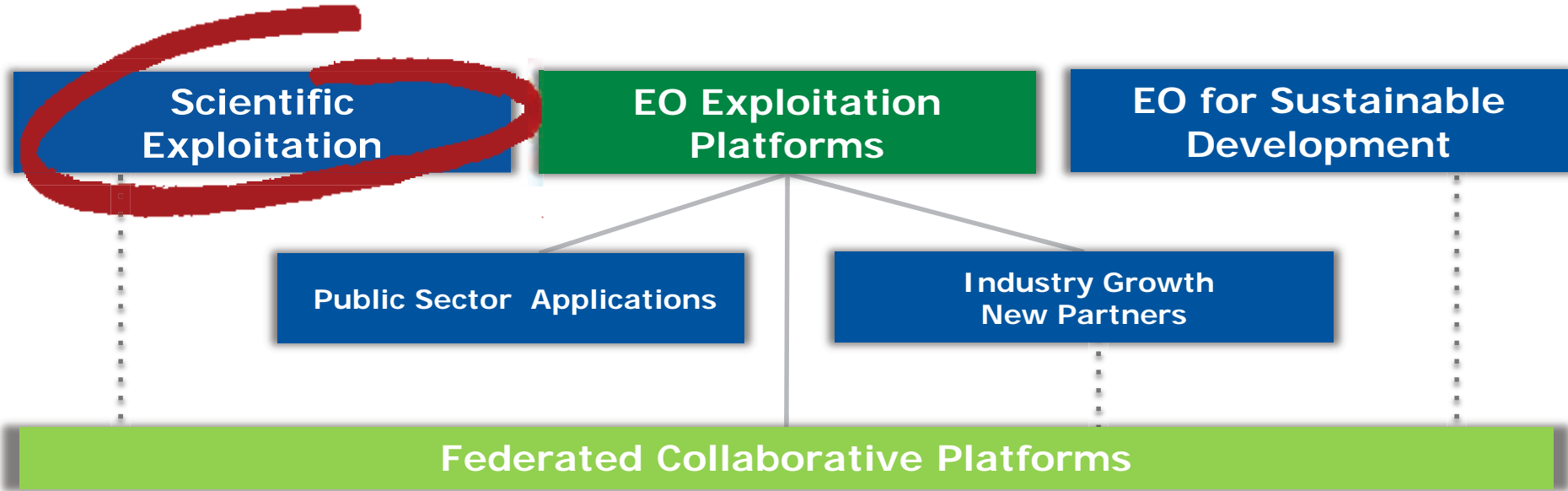
- Foster scientific excellence
- Pioneer new EO applications
- Stimulate downstream industry growth
- Support international responses to global societal challenges

Built on successes of previous exploitation activities:

- adapting them to the new European EO context
- responding to recommendations of EOEP-4 programmatic and scientific review







**New:** Some 10% of the budget assigned via open calls to support industry/user initiatives.

# EO Science for Society: Scientific Exploitation



Addressing the needs of the scientific community in terms of novel observations, new methods, innovative product and leading edge scientific results maximizing the scientific return of ESA and European missions

Engaging international science community

**Expanding dialogue** with the international scientific community with focus on the young generations

Developing open science practices and tools

**Developing Open Science** activities and practices using latest tools and techniques

Advancing EO methods and techniques

**Launching** state-of-the-art **R&D studies** for maximizing scientific exploitation of EO missions (methods and products)

Advancing Earth system science

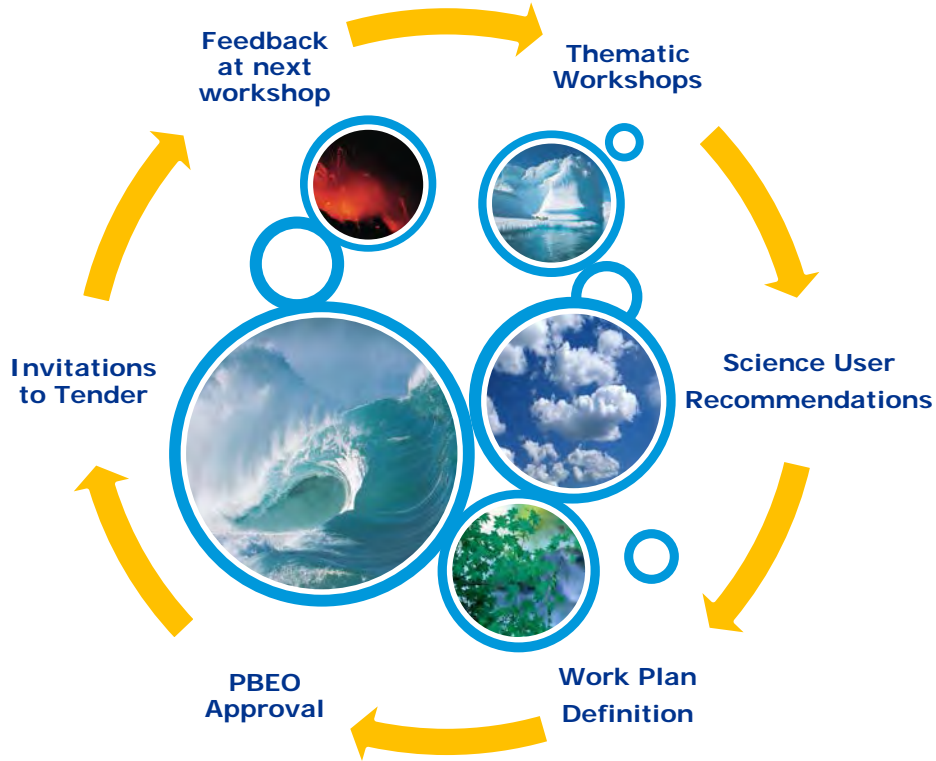
**Addressing** open questions in **Earth system science** in collaboration with major international science initiatives

Translating exploitation results into new mission concepts

**Reinforcing** the role of **exploitation** results as a **driver** for **future missions**



# Scientific Exploitation: Consultations

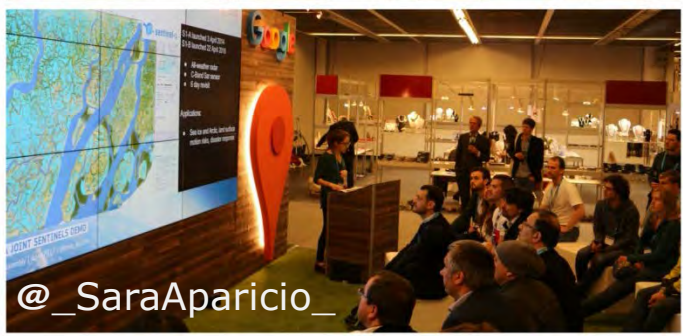




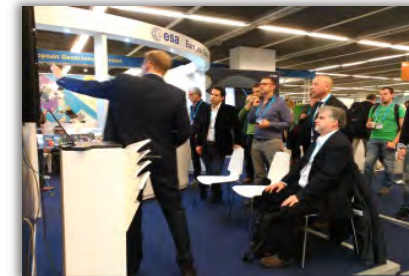
# Scientific Exploitation: Example of EGU2017



Live demonstrations of large-scale processing of Sentinel-1/2 data using Google Earth Engine



Sharing material & info at ESA Booth



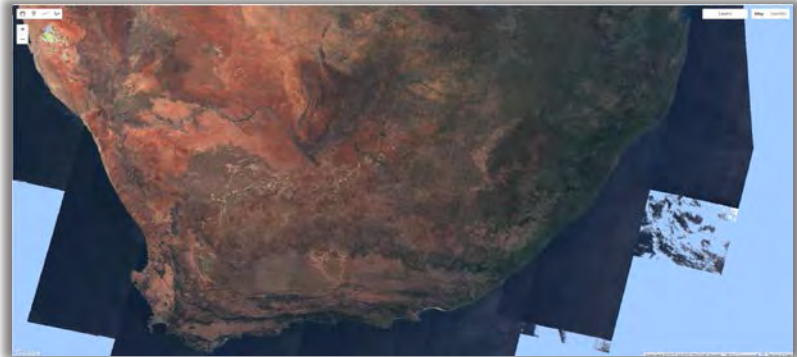
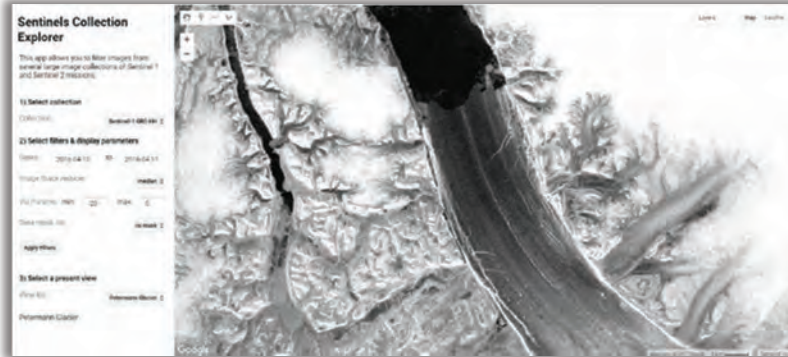
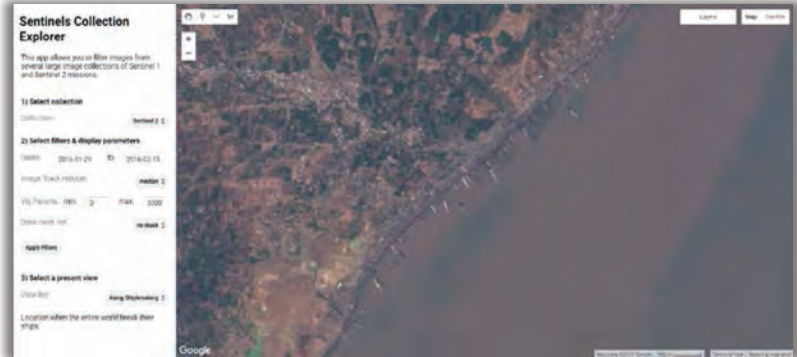
21 demos/day on ESA data access an toolboxes



# Scientific Exploitation: Example of EGU2017



Examples of Sentinel processing on GEE by @\_SaraAparicio\_, ESA Young Graduate Trainee:

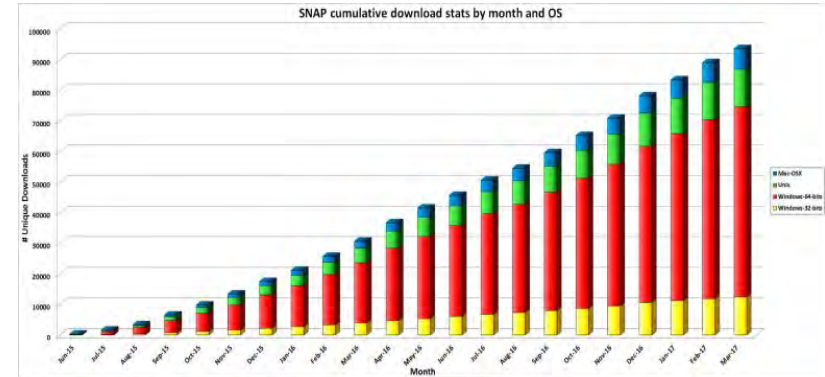


# Scientific Exploitation: Toolboxes



## SNAP open source toolbox

- for Radar/Optical/Thermal data exploitation
- used in 190 countries
- more than 90 000 downloads
- <http://step.esa.int/main/download>



## STEP (Science Toolbox Exploitation Platform)

- EO science collaborative portal
- Technical forum and community animation
- Gathering user feedback and usage
- Communicating on results
- On line tutorials
- 200 000+ visitors





# Finding and Engaging the (Young) Talents



## Education, training, and capability building

- to develop the scientific expertise and technical skills that fuel innovation
- adapted to take account of the specific needs and priorities of new and/or smaller ESA member states



Cryosphere Training, Svalbard  
June 2018



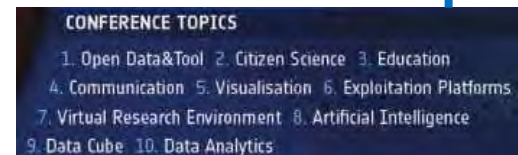
Land Training, Gödöllő  
September 2017



OceanTraining, Porto  
September 2017



EO Open Science, Frascati  
September 2017 - @EO\_Open\_Science



# Evolving IT Possibilities: New Developments for EO

- New companies (not traditionally space-related) becoming active in space (Google, Amazon, etc.)
- Easy data access
- 7 billion cell phones worldwide
- Social media
- Crowdsourcing
- Cloud computing, big data analytics

Time for a paradigm shifts in EO programmes?

- "never say never"
- "fail fast, fast forward"
- Act when 90% ready, risks management
- Time is the only non-renewable resource
- Clear vision-driven implementation
- Access to venture capital

**#FutureEO**



Election Pope Benedict XVI



Election Pope Francis

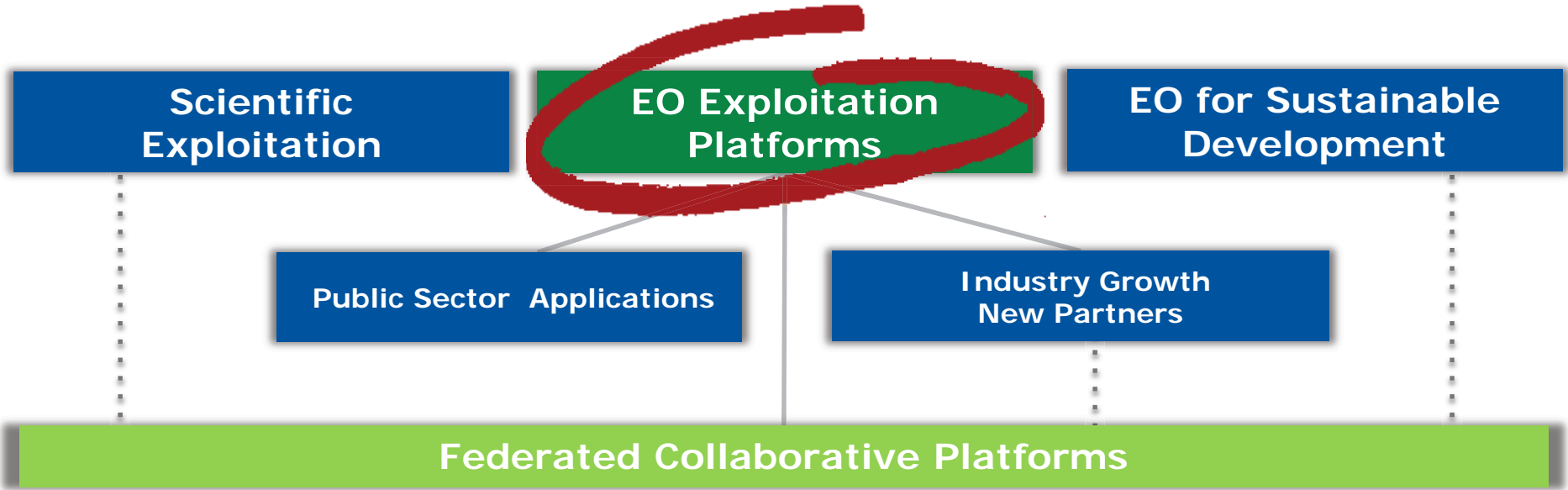


# ESA Thematic Exploitation Platforms





# EO Science for Society: Components



**New:** Some 10% of the total budget will be assigned via **open calls** to support industry/users initiatives.





→ FOOD SECURITY TEP

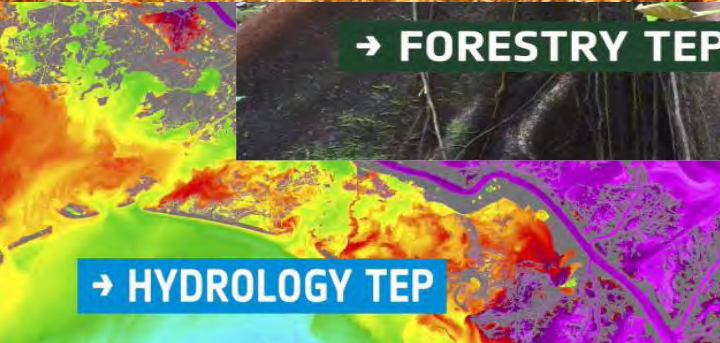


→ FORESTRY TEP



→ URBAN TEP

Session by  
A. Marin,  
Wednesday



→ HYDROLOGY TEP



→ GEOHAZARDS TEP



→ COASTAL TEP



→ POLAR TEP





# ESA Climate Change Initiative





**Session by  
W. Dorigo,  
Friday**

# CLIMATE CHANGE INITIATIVE



Zhelin reservoir

11  
July  
2015

Poyang

Nanchang

0 50 km

