

# ESA EO Programmes for CM16

## EOEP-5 Block 1

Bilateral meeting with  
AT Delegation and  
Industry

Vienna, 24/05/2016

# EOEP-5: Future Missions

## Block 1: Mission preparation, instrument pre-development

1. Industrial studies on systems & key technologies
  2. End-to-end simulation frameworks
  3. Instrument pre-development
  4. Campaigns
- EE9 Early Phases (and later development under block 2)
  - EE10 Early Phases
  - Call for early Mission Concepts
  - EO Opportunity Mission
  - CSC evolution Early Phases
  - Polaris preparatory activities

- A faster approach to achieve an Earth Explorer Mission
- 120 M€ (industrial costs)
- Related to challenges the solution of which will help to best respond to issues facing society
- Underlying the Call are:
  - Earth Observation Science Strategy for ESA: A New Era for Scientific Advances and Societal Benefits, ESA SP-1329/1 and
  - ESA's Living Planet Programme: Scientific Achievements and Future Challenges – Scientific Context of the Earth Observation Science Strategy for ESA, ESA SP-1329/2, ESA, Noordwijk, the Netherlands, 2015
- Eligible are mission concepts that exhibit a certain degree of technical and scientific maturity, or “readiness”.

- Proposed mission concept shall address science questions that have a more direct bearing on societal issues such as:
  - Food security
  - Availability of fresh water
  - Management of the Earth's resources and energy
  - Health of the planet and humankind
  - Disaster risk reduction and improvement of disaster resilience
  - Climate change
- Mission concepts which exhibit a certain degree of scientific and technological maturity (SRL of at least 4 [ $\geq 4$ ]), they still must demonstrate **scientific excellence and innovative technology**
- The proposal shall demonstrate sufficient technology readiness, in particular of the payload, and that a TRL of at least 4 ( $\geq 4$ ) is achieved for all critical technologies
- Deadline to submit proposals: 24 June 2016

# ESA's EO Science Strategy at a glance

**Ground-breaking exploratory missions** integrated into flexible observing systems for Earth system science

**Sustained observations** to understand and attribute trends beyond the expected variability

**International co-operation** to provide an integrated, optimised Earth observing system, which can grow in capability in a cost-effective manner

**Translational science** to synthesize and adapt the data streams from individual instruments and satellites into knowledge

**Wider Communication and dialogue** with people beyond the scientific sector to help explain the value, opportunities and inspiration provided by EO from space



## EE10 Early phase

- Need to maintain a regular mission launch schedule and the ability to respond to a challenging scientific agenda.
- The solid preparation of EE-10 in EOEP-5 is necessary in order to secure a new EE in EOEP-6, with a launch towards the end of the next decade.
- EOEP-5 will therefore cover:
  - Preparation of a Call for EE Mission Ideas, evaluation of proposals, selection of candidate missions;
  - Phase 0 activities for selected candidates, down-selection for missions to enter phase A
  - Phase A for selected candidates (assuming resources permitting)
- EE-10 activities in EOEP-5 will make use of SRL and TRL targets and be based on corresponding preparatory strategies to ensure these targets are achieved.
- A launch of EE-10 in 2027-2028 can be a realistic target assuming optimization of the selection and implementation processes.

# Call for early Mission Concepts

- Need for regular calls for new preliminary mission ideas and/or (associated) technology
- This process is not to be mistaken for the call for Earth Explorer missions ideas/proposals, which comes at a later stage
- Such early concept studies would generally accept a much higher level of risk
- The ensuing calls would allow entities in all Participating States to progress with the maturation of mission concepts and the associated technology and/or instrument pre-development activities
- Proposals would be retained through a well-regulated prioritization process involving ESAC (and/or other advisors, depending on the users communities targeted by the proposals)

# EO Opportunity Missions

- To prepare the ground for future EO Opportunity mission together with a partner
- EOEP-5 will support the phase A/B1 type of activities and associated early instrument pre-development, for mission candidate(s).
- EO Opportunity mission activities in EOEP-5 will have pre-defined SRL and TRL targets.
- The actual implementation of the mission would be part of EOEP-6 or possibly a future Earth Watch element, assuming suitable candidates are identified and agreed by Programme Participants.



# Copernicus Space Component Evolution (early phases)

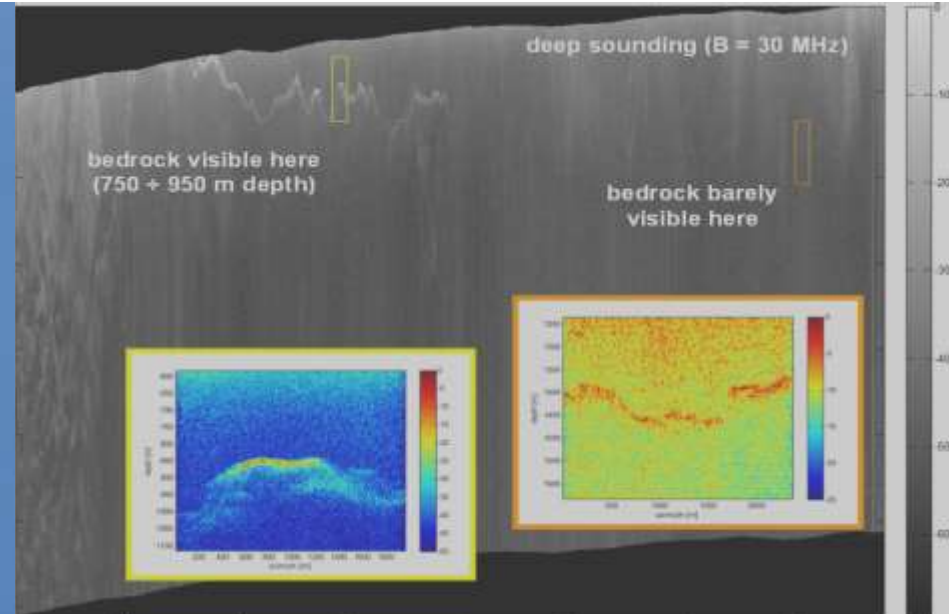


- The evolution of the Copernicus Space Component (CSC) can be seen in two lines:
  - CSC extension (next generation), driven by continuing observation requirements beyond the current Sentinel generation (i.e. beyond 2030);
  - CSC expansion, providing additional observations in support of emerging EU policy priorities; these could be realized from around 2023
- High Priority Candidate Missions (HPCMs) that are being further investigated by EC and ESA:
  - an imaging spectrometer for greenhouse gas (GHG) monitoring (mainly CO<sub>2</sub>)
  - a high-resolution thermal infrared imaging system (agriculture, urban)
  - an enhanced interferometric SAR altimetry system (polar ice and ocean)
  - a hyper-spectral land imaging system (agriculture and environment)
  - a microwave imaging radiometer for soil moisture observations
- To include
  - requirements, architecture and system studies
  - early development for instruments and for key technologies
- Specifically for the GHG/CO<sub>2</sub> candidate mission, :
  - studies to quantify the added value of a space measurement capability
  - instrument requirements consolidation phase
  - consolidation of mission requirements

# Polaris preparatory activities

- Polaris is a potential Earth Watch mission contributing to the monitoring of the rapidly evolving Arctic environment.
- Initial activities started in EOEP-4 (user requirements and feasibility studies)
- Parameters of importance include snow depth, snow water equivalent, sea ice thickness, freshwater fluxes
- Operational needs are focusing on meteorology, climate change and security-related issues
- Based on earlier seed activities, potential mission concepts may include a HEO (highly-elliptical orbit) VIS/NIR imager (for weather prediction), a LEO hyper-spectral imager (environmental monitoring), a LEO Cryosat follow-on (sea ice, Arctic seas), and a LEO SAR (S&R, environmental monitoring).

# ESA Campaign activities



# Why does ESA run campaign activities ?

## ESA campaign activities started in 1981

120 campaigns as of October 2014  
 (+10 since last report)  
 Typically 8-10 campaigns/year

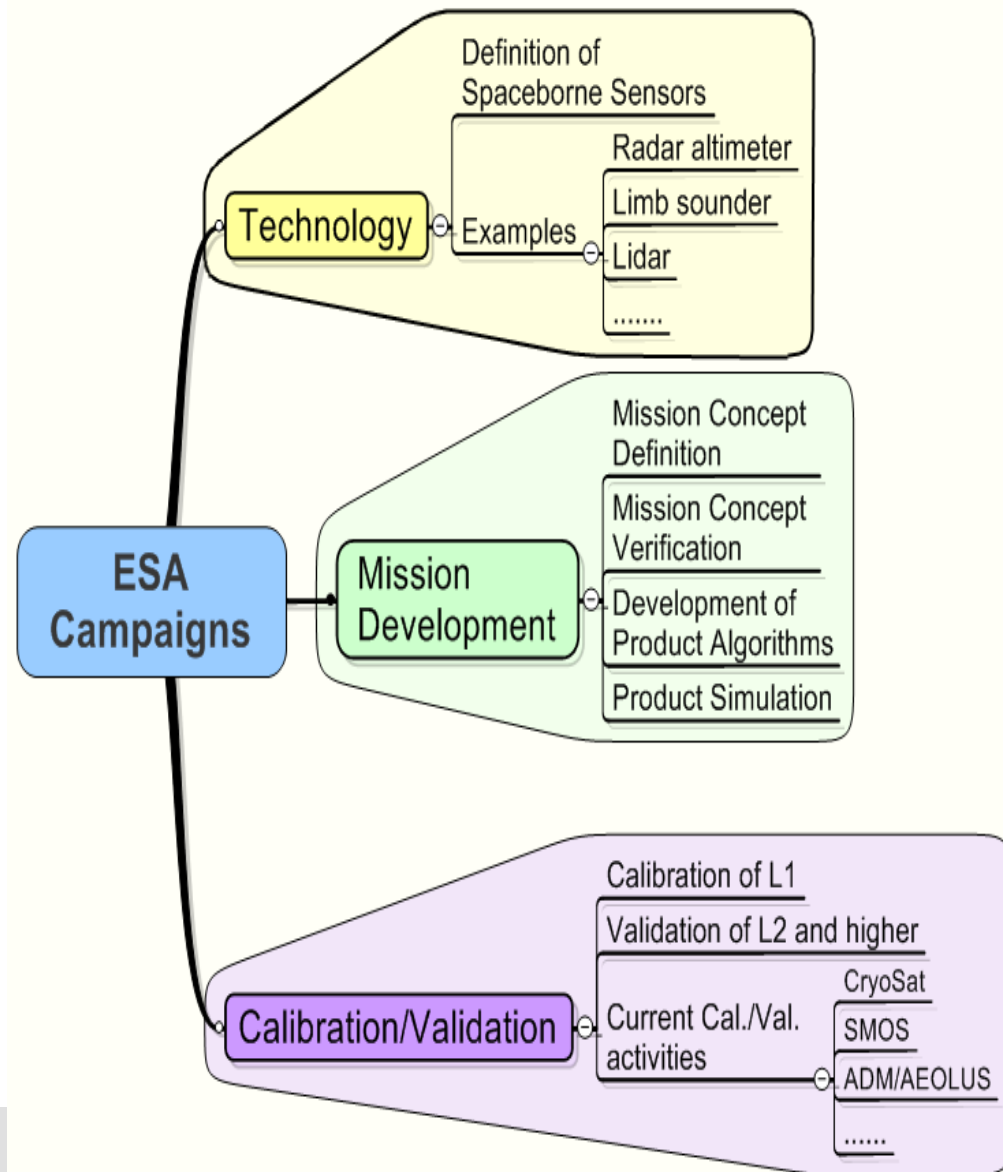
## Strategic objectives:

Support to EO programs  
 Transnational access to airborne facilities in member states  
 Partnerships with national and international organisations

## Campaign activities address three main areas:

Technology  
 Mission development  
 Calibration/validation

## Campaign data archive supporting science and applications



# Role of ESA campaigns and added value for Austria

1. Development of instrument expertise
  - a. Hardware design (radar, optical, laser)
  - b. Proof-of-concept for future satellite missions/early participation in mission design issues
  - c. New opportunities and applications (e.g. through UAVs/High Altitude Platforms)
  - d. Integration of European payloads (e.g. Airborne Technologies)
2. Access to international campaign activities
  - a. Transnational access to aircraft and airborne/ground instruments
  - b. Participation to international airborne/ground campaigns
  - c. Scientific and technical exchange
3. Data processing
  - a. Develop data processing capabilities as stepping stone to role satellite ground segment
  - b. Develop scientific interpretation of remote sensing data