Space in Horizon 2020 (2014-2020) Horizon Europe (2021-2027)

ESSC Plenary meeting
"On-Line" 27 November 2020

Space Research, Innovation and Start-ups, DG DEFIS/B2

HORIZON 2020

European Union programme
for research and innovation
for 2014-2020

European Commission

LINKS TO OTHER H2020 PARTS

Priority 1
Excellent science

- **European Research Council (ERC)**
- **Future and Emerging Technologies (FET)**
- **Marie Sklodowska-Curie Actions**
- **Research infrastructures**

Priority 2
Industrial leadership

- Leadership in enabling and industrial technologies (LEIT)
  - Information and Communication Technologies (ICT)
  - Nanotechnologies
  - Biotechnology
  - Advanced manufacturing and Processing
  - **Space**
- Access to risk finance
- Innovation in SMEs

Priority 3
Societal challenges

- SC1 - Health, demographic change and well-being
- SC2 - Food security, sustainable agriculture and forestry, Marine, Maritime and Inland water research, and Bioeconomy
- SC3 - Secure, clean and efficient energy
- SC4 - Smart, green and integrated transport
- SC5 - Climate action, Environment, Resource efficiency and Raw materials
- SC6 - Europe in a changing world – Inclusive, Innovative and Reflective societies
- SC7 - Secure societies – Protecting freedom and Security of Europe and its citizens

HORIZON 2020

Opportunities in Priority 1

Excellent Science

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The ERC offers…

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Marie Skłodowska-Curie Actions

Education and Culture

HORIZON 2020

Opportunities in Priority 2

Space

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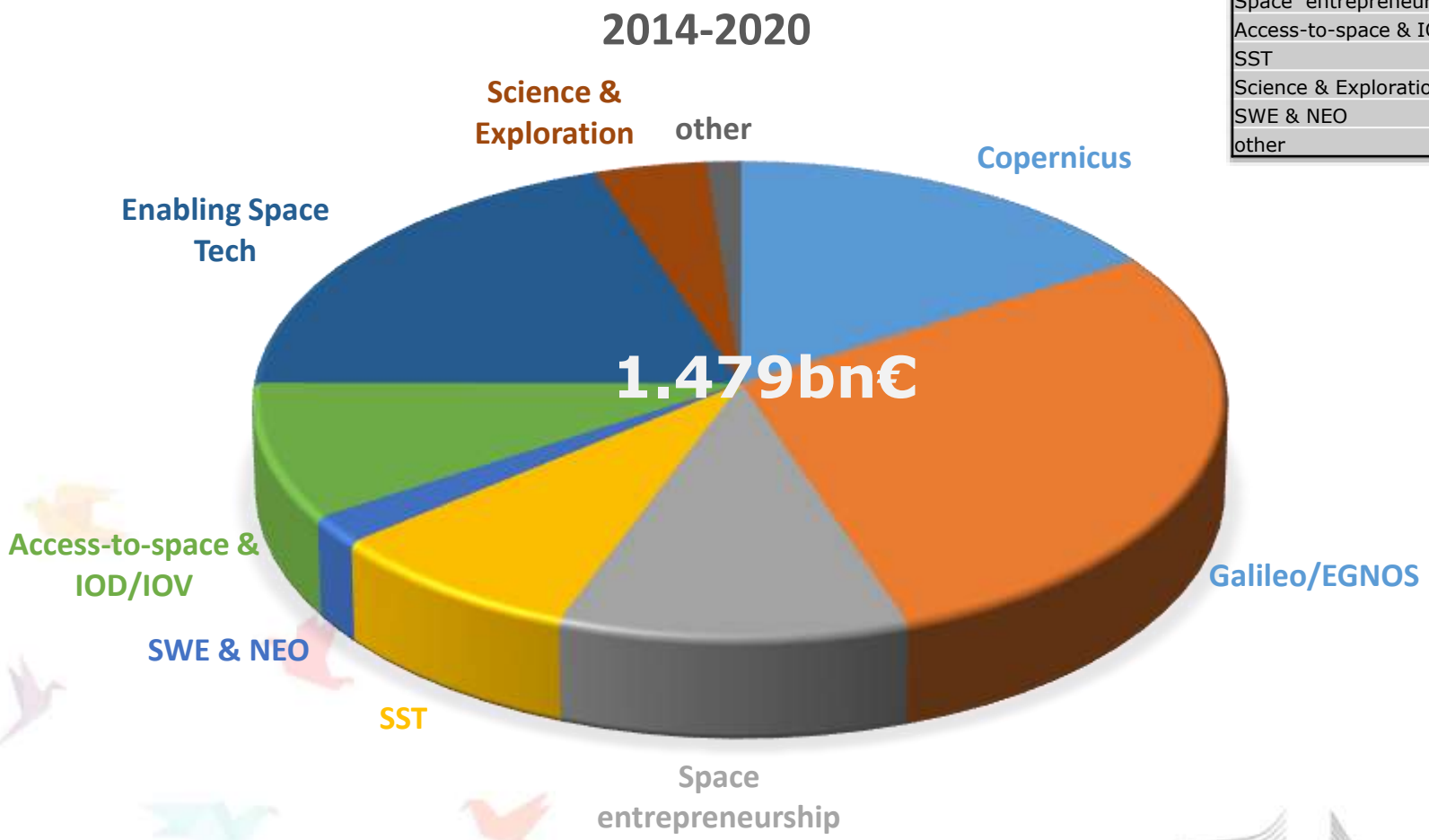
SPACE RESEARCH BUDGET IN HORIZON 2020

Galileo/EGNOS	29%
Enabling Space Tech	20%
Copernicus	16%
Space entrepreneurship	11%
Access-to-space & IOD/IOV	9%
SST	8%
Science & Exploration	4%
SWE & NEO	2%
other	1%



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H2020 PRIORITY 2: INDUSTRIAL LEADERSHIP

SPACE RESEARCH

Maximising benefits of space for society and EU economy

SPACE-EO

- EO market uptake
- Copernicus mission and services evolution

SPACE-EGNSS

- EGNSS market uptake
- EGNSS infrastructure, mission and services evolution

SPACE-BIZ

- Support to space hubs
- Space outreach and education
- EIC Horizon Prize on "Low cost Space Launch"
- InnovFin Space Equity Pilot (ISEP)
- SME-instrument
- FTI – Fast Track to Innovation

Globally competitive and innovative space sector

SPACE-TEC

- Technologies for European non-dependence and competitiveness
- **Space robotics**
- Electric propulsion
- Generic space technologies
- EO and SatCom technologies

SPACE-SCI

- **Scientific instrumentation and technologies for exploration**
- **Scientific data exploitation**

Access to space & Secure and safe space environment

SPACE-TEC

- Access to space
- In-Orbit-Demonstration/Validation (IOD/IOV)

SPACE-SEC

- **Space weather (SWE)**
- Space traffic management (STM)
- Space Surveillance and Tracking (SST)
- **Near Earth Objects (NEOs)**

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Science and exploration

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H2020-SPACE-2014-2020
Science and exploration

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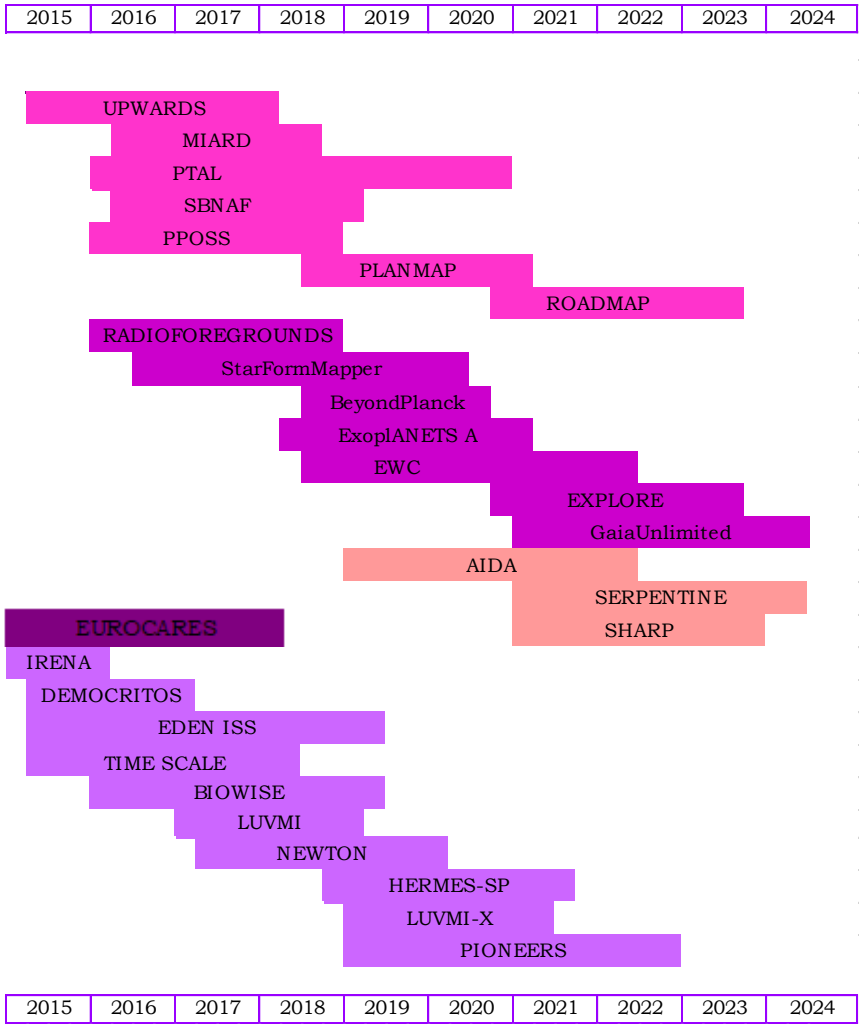
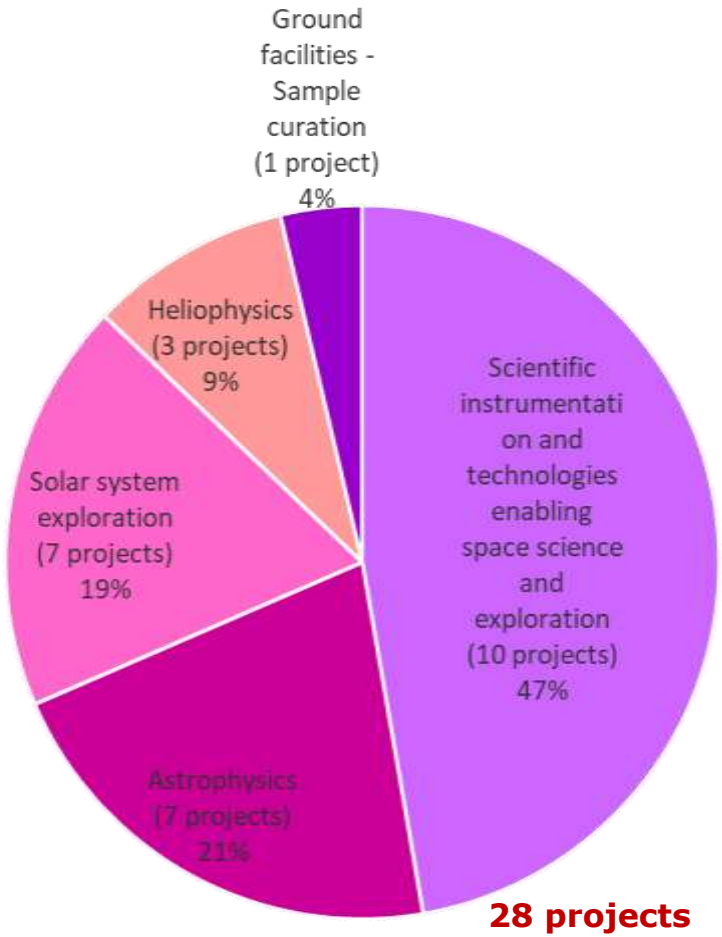
Funded projects by area





28 projects

2 additional proposals in GAP NEMESIS and XMM2ATHENA not included on this slide

SCI 2014-2020 Calls for proposals	
Total EU contribution (M€):	**54.15**

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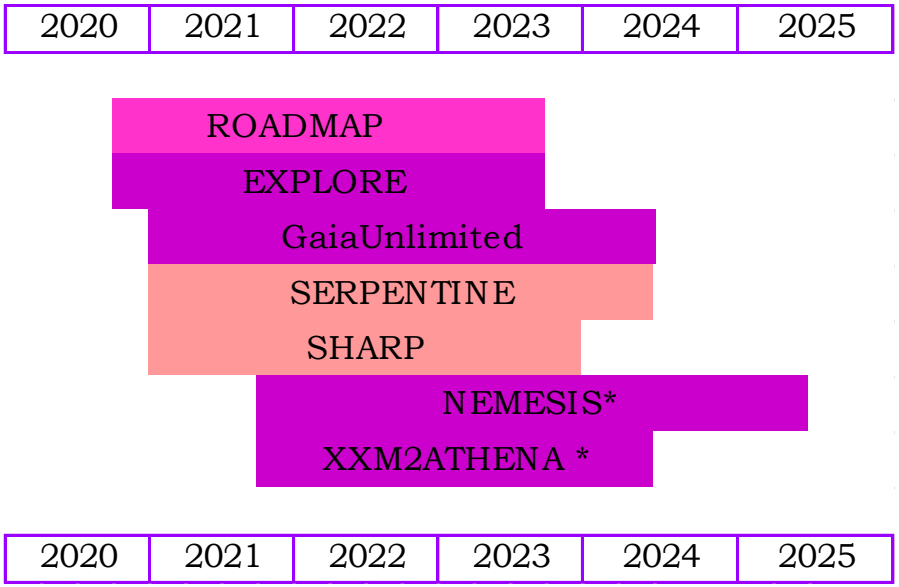
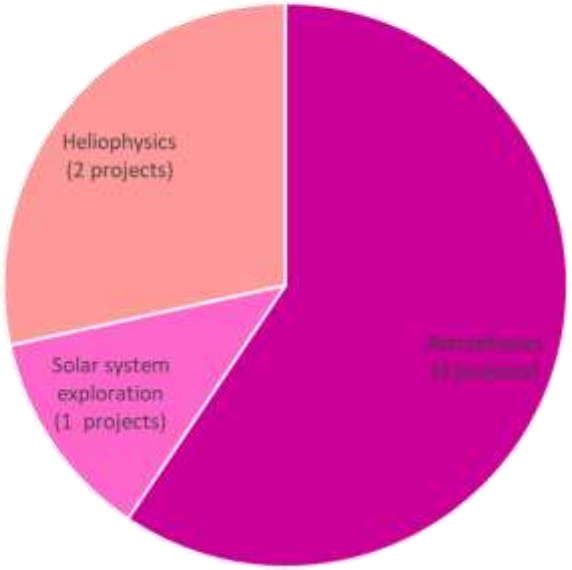
Funded projects by area

Understanding Planet Mars With Advanced Remote-sensing Datasets and Synergistic Studies
Multi-instrument analysis of Rosetta data – Establishing a new paradigm for cometary activity
Planetary Terrestrial Analogues Library
Small Bodies: Near and Far
Planetary Protection of Outer Solar System
Planetary Mapping
Ultimate modelling of Radio foregrounds: a key ingredient for cosmology
A Gaia and Herschel Study of the Density Distribution and Evolution of Young Massive Star Clusters
Beyond Planck - delivering state-of-the-art observations of the microwave sky from 30 to 70 GHz for the next decade
Exoplanet Athmosphere New Emission Transmission Spectra Analysis
Enabling Weak lensing Cosmology
Artificial Intelligence Data Analysis

Funded projects by area





7 projects

** proposals from the Reserve list in GAP*

ROADMAP

ROle and impAct of Dust and clouds in the Martian Atmosphere: from lab to space

- Improve our understanding of the Martian atmosphere, with focus on aerosols (dust and ice clouds);

- Define and create a more adequate and representative Martian dust analogue
- Obtain relevant laboratory measurements to improve the radiative modelling of the Martian dust and clouds;

- Develop specific models to improve the parameterization of dust and clouds within Global Circulation Models (GCMs);
- Improve the analysis of past and current missions to Mars considering the new laboratory data and the new tools/models;

- Improve the modelling of the global Martian climate through specific models and through GCMs to provide a more realistic atmospheric climatology

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EXPLORE

Innovative Scientific Data Exploration and Exploitation Applications for Space Sciences

- Deployment of machine learning (ML) and advanced visualization tools to achieve efficient, user-friendly, realistic exploitation of scientific data from astrophysics and planetary space missions, as well as from supporting ground-based massive surveys.

- Development of 6 high-level tools and methods implemented as Scientific Data Applications, which address large scientific audience:
  - Two related to Lunar observation,
  - Two related to Galactic Science
  - Two related to stellar characterization

- Available on a dedicated cloud solution - EXPLORE-TEP
- Available on existing cloud platforms ESCAPE Science Application Platform and the ESA Datalabs

GaiaUnlimited

Who is In, and Who is Not? Determining the Gaia Survey Selection Function

- Develop a detailed mathematical formulation of a survey selection function* with focus on the Gaya survey,
- Develop a detailed description and modelling of the Gaia survey selection function and for the combination of Gaia and other surveys
- Practical implementation of the Gaia selection function in the form of auxiliary data,
  - ✓ accessible through the ESA Science Data Centre, and open source tools
  - ✓ made available through code hosting platforms.
- Develop tools to incorporate the selection function in scientific analyses
- Application of the selection function tools to example science cases.

* *the probability that an object with certain observed properties at a given position on the sky would be catalogued by Gaia*.

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SERPENTINE

Solar EneRgetic ParticlE aNalysis plaTform for the INner hEliosphere

- A major step in understanding large and widespread gradual Solar Energetic Particle (SEP) events
- Motivated by the science objectives of Solar Orbiter and Parker Solar Probe
- Building the world's most advanced platform for SEP studies, including:
  - ✓ high-level data products, catalogs and datasets,
  - ✓ analysis and
  - ✓ visualization tools.

SHARP

SHocks: structure, AcceleRation, dissipation

- Advances understanding of the physics of charged particle acceleration and heating and collisionless dissipation in Collisionless Shocks (CSs) across a range of scales in the Universe
- Exploitation of the wide diversity of CSs observed by ESA and NASA heliospheric missions
- Improved understanding of
  - ✓ the acceleration of particles at CSs
  - ✓ particle acceleration at astrophysical shocks
- Developing a high-level databases of shocks and advanced tools for the shock analysis

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Success story
SBNAF
Coordinator:
MPE/Germany
www.sbnaf.eu

- ✓ Addressed critical points in the reconstruction of physical and thermal properties of near-Earth, main-belt, and trans-Neptunian objects.
- ✓ Established the first database of thermal infrared observations of small bodies in the solar system, with more than 170,000 thermal infrared measurements of asteroids from space infrared telescopes.
- ✓ Developed high-quality 3D shape models for selected asteroids.
- ✓ Upgraded Interactive service for asteroid models (ISAM); it it includes models and data for more than 1600 asteroids.

- ✓ High-quality predictions for occultation events resulting in successful detections of occultation's of transneptunian objects and Centaurs;
- ✓ Numerous outreach events;
- ✓ 74 scientific publications among which article about the discovery of ring around the Haumea dwarf planet in Nature
" The size, shape, density and ring of the dwarf planet Haumea from a stellar occultation"
https://www.nature.com/articles/nature24051

H2020-SPACE-2014-2020
Exploration & Instrumentation

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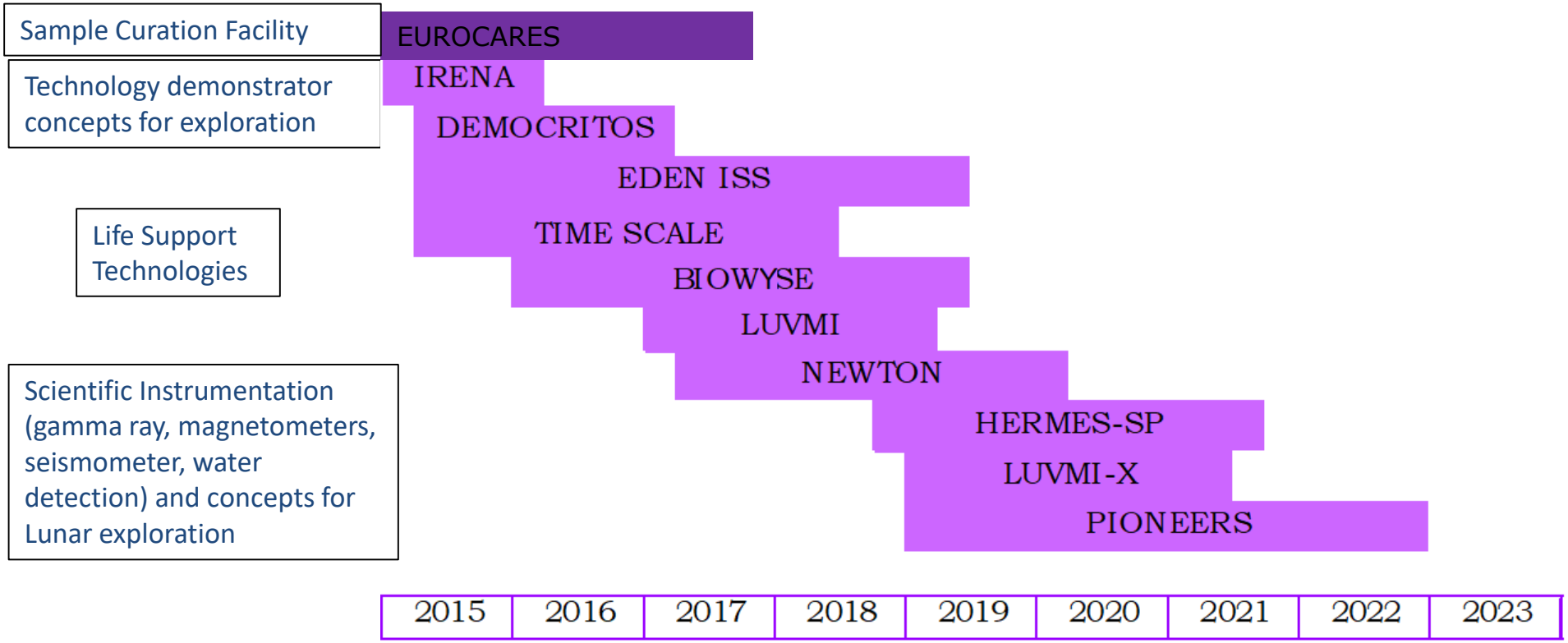

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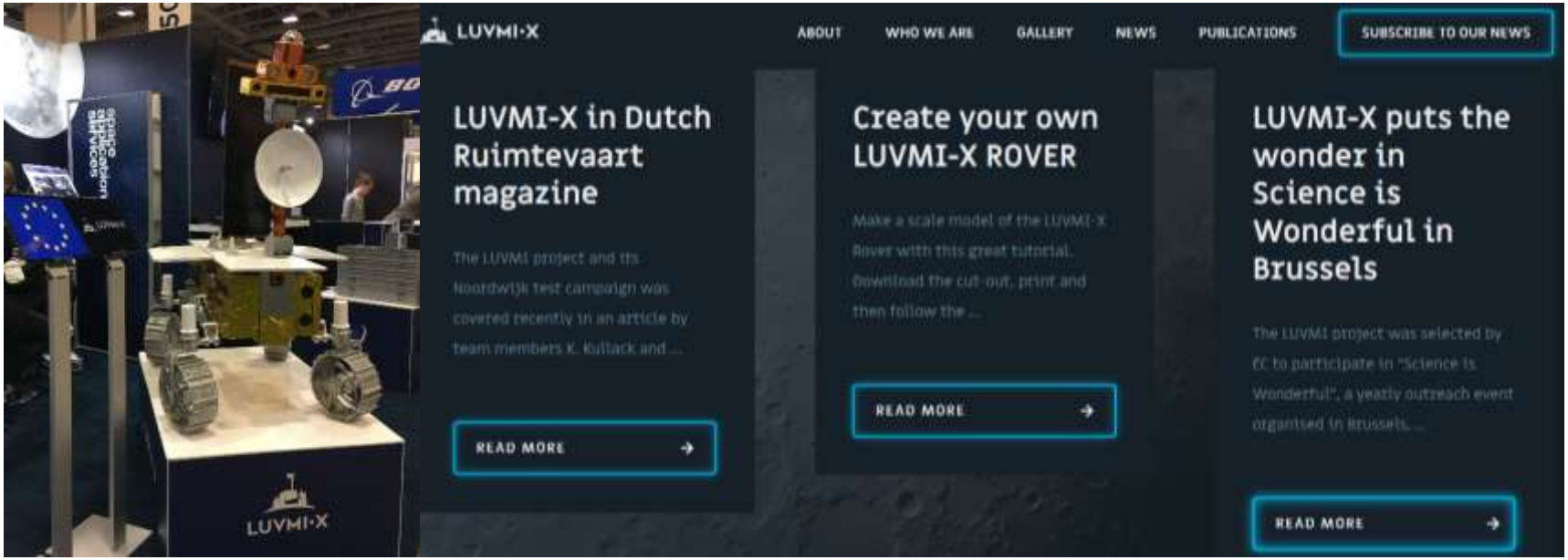
LUVMI-X is a small, autonomous lunar rover with big ambitions. Equipped with innovative instrumentation, it aims to search out water and other volatiles on the lunar surface.



HERMES-SP (2018 - ongoing)

High Energy Rapid Modular Ensemble of Satellites
Scientific Pathfinder

Scientific Objective:
Detection and accurate localization of Gamma Ray Bursts (GRB)

Mission:
GRB detectors in a constellations of small satellites

- 3 CubeSats HERMES-SP
- 3 CubeSats (Italian Space Agency - HERMES-TP)
- Launch to be managed by ASI, possibly in 2022
- 1 additional payload (Australian Space Agency)

Achievements

- Exploitation of previous technological studies for the design and the realization of the GRB detector (cutting-edge instrumentation for scientific missions)
- Constellation of detectors to improve the localization performance compared to the actual systems
- Interest of the scientific community since the early stage of the project / international cooperation

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Secure and safe space environment

Space Weather	GovSatCom
NEOs	STM
Debris Mitigation	SST

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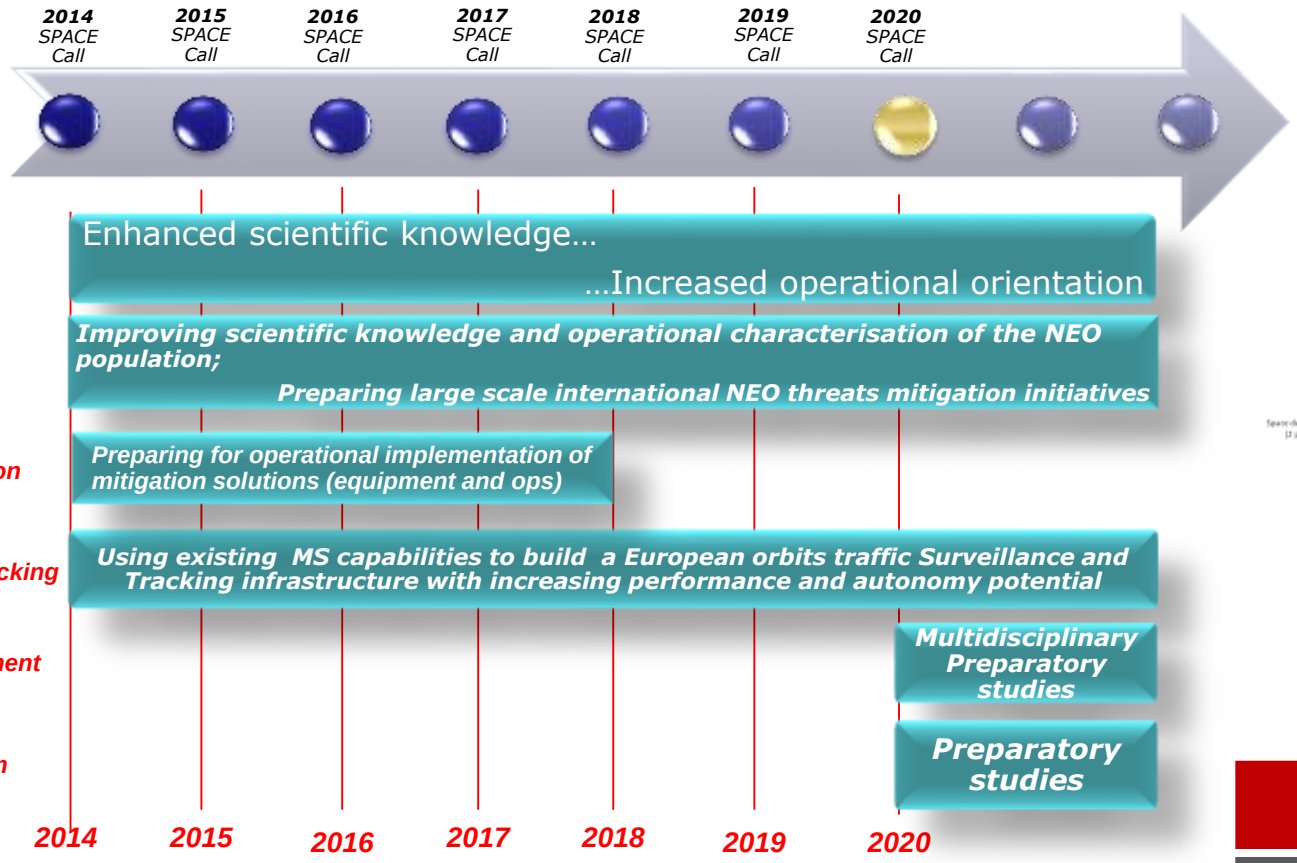
H2020 LEIT SPACE
Secure and safe space environment



21 projects

SEC 2014-2020
Calls for proposals
and ad-hoc calls

Total EU contribution (M€):	**153.5**

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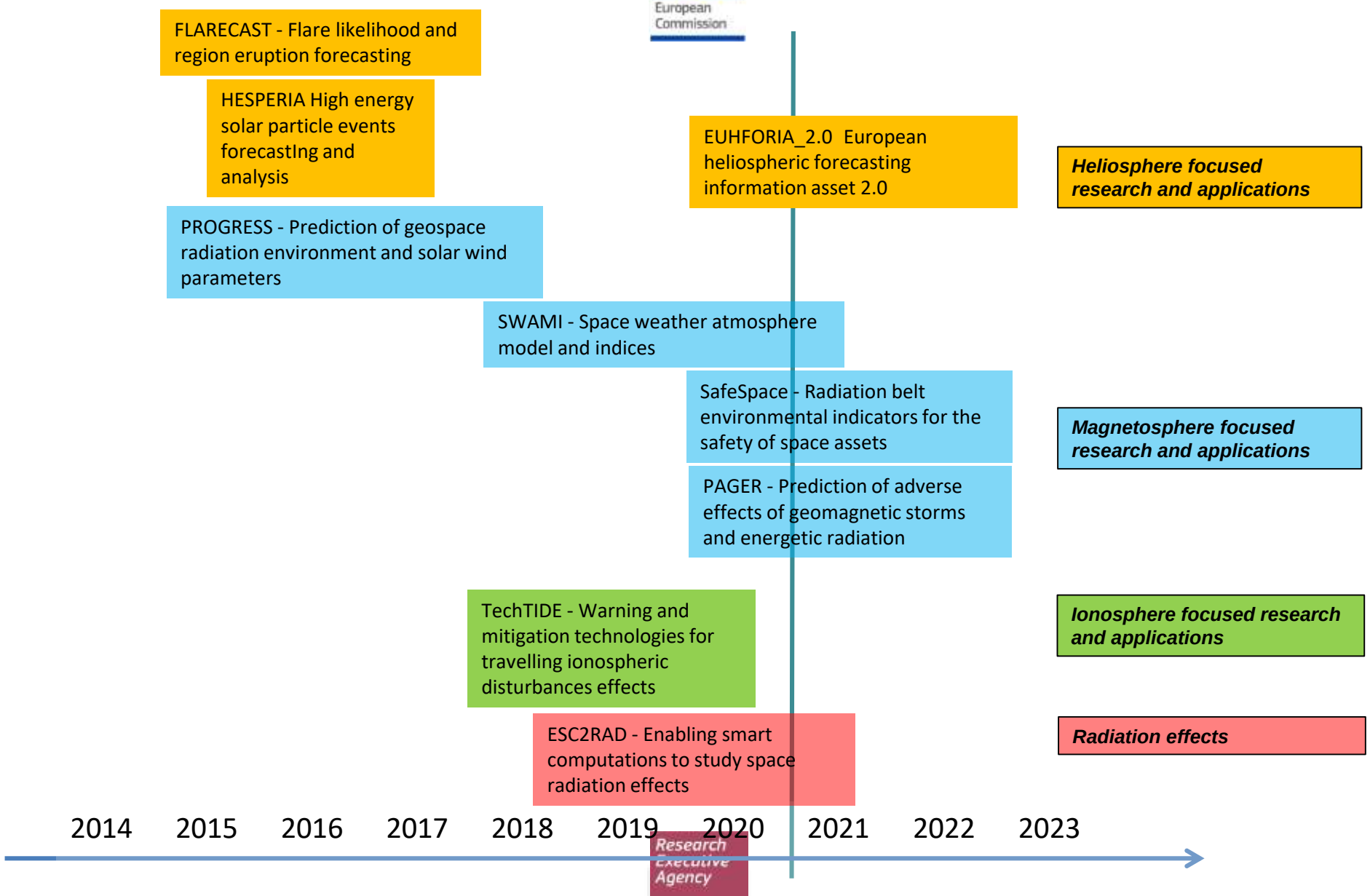
H2020 LEIT SPACE
Space Weather

9 projects
M€ 17.8



Find projects' descriptions and results

https://cordis.europa.eu/

Thank you
for your attention

mats.ljungqvist@ec.europa.eu

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