

Giornate INAF 2-5 maggio 2023

Unità Scientifica a Carattere Tematico Gestionale IV

Divisione Nazionale Abilitante della Planetologia ed Esplorazione del Sistema Solare

Francesca Esposito

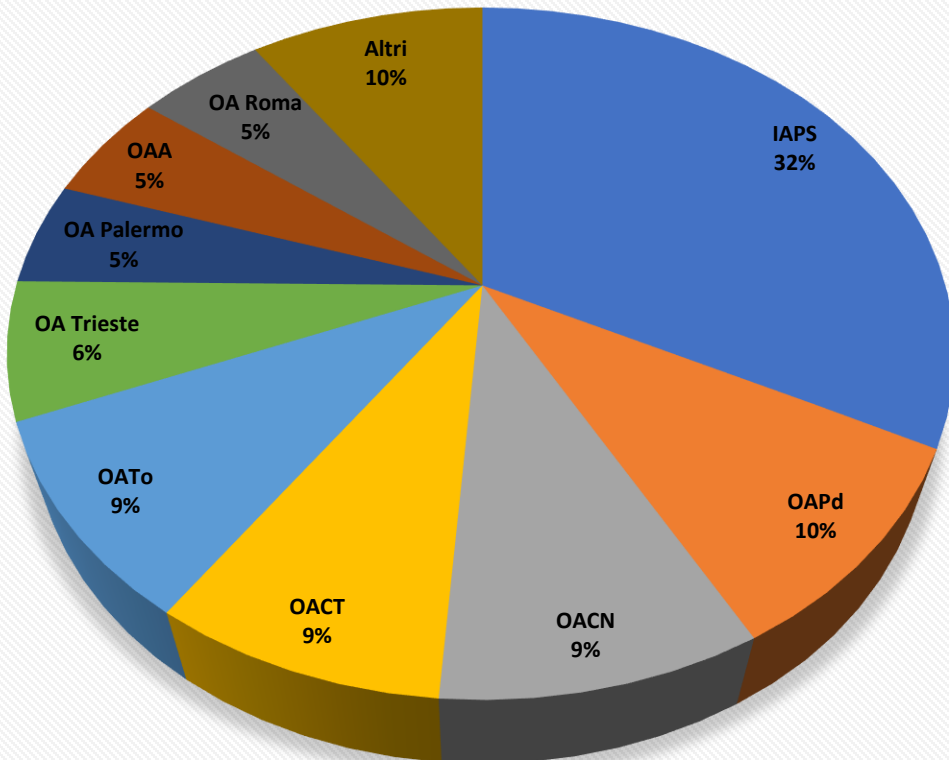
Planetary Science and Exploration of the Solar System @ INAF

Personnel

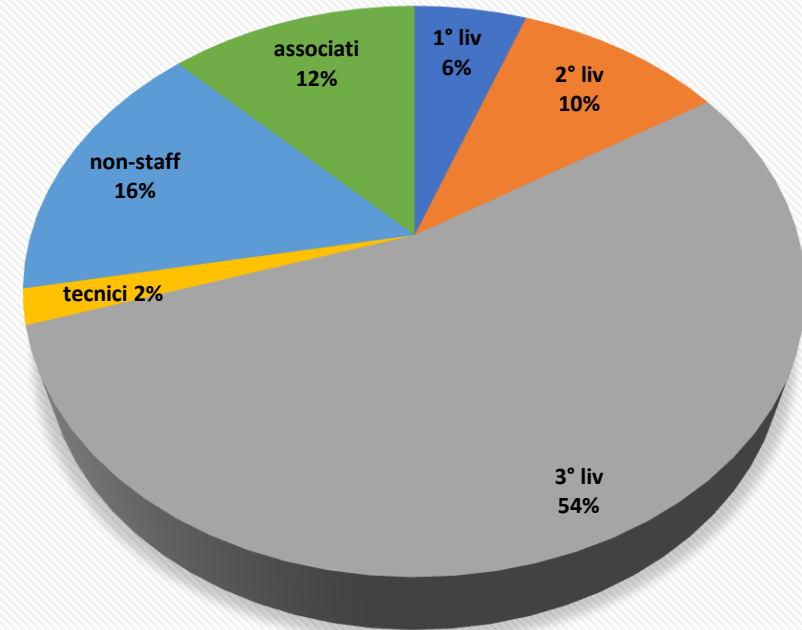
250 personnel units:

- ~219 located in 15 INAF Institutes
- ~ 31 associates

Geographical distribution



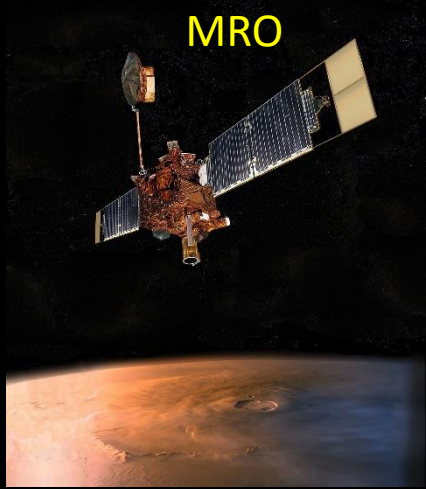
Professional Profiles



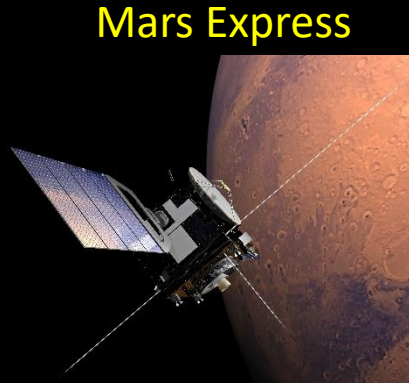
Science topics

- Planetary Science
- Sun & Space Weather
- Astrobiology
- Laboratory astrophysics
- Space technology

INAF Technologies & science contribution: Space missions in operations



MRO



Mars Express



Juice



Juno

Solar Orbiter



ExoMars Trace Gas Orbiter



CSES-Limadou



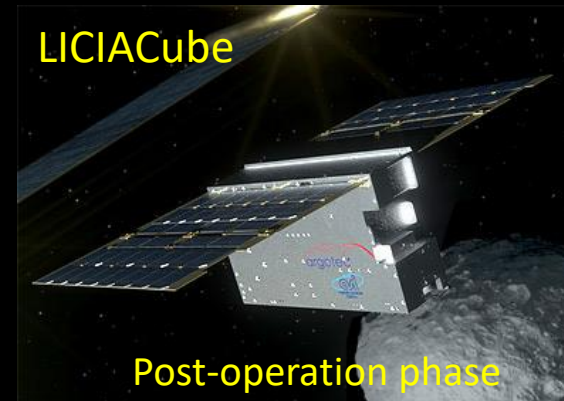
BepiColombo



Osiris-Rex



LICIACube



Post-operation phase

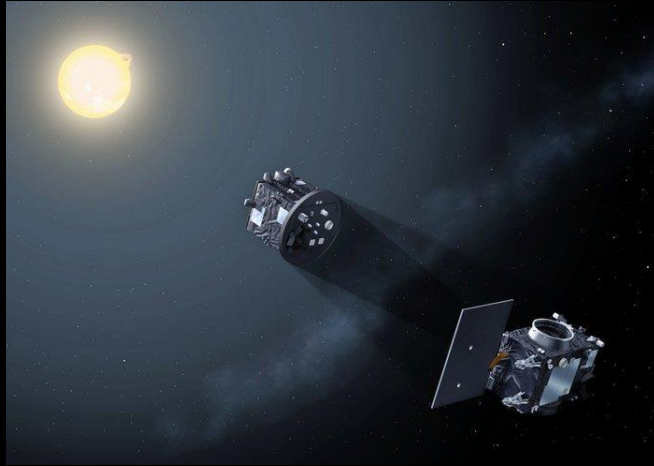
Hayabusa-2



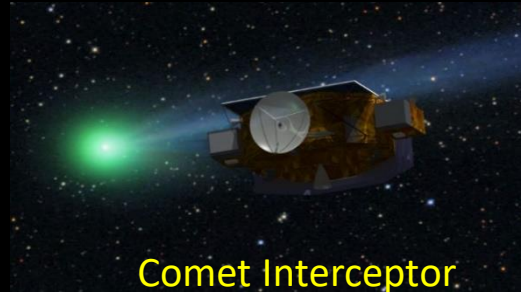
INAF Technologies & science contribution: Space missions in development



Proba3



Comet Interceptor



Tianwen-2



MUSE



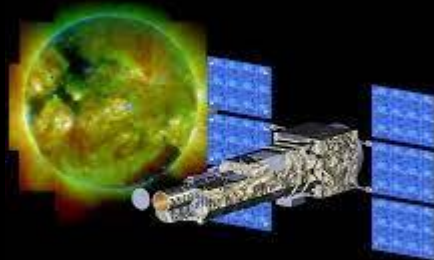
Prospect / CLPS 2025/2026



ExoMars Rosalind Franklin 2028



Solar-C EUVST



UAE Asteroid Mission



CSES-Limadou-2

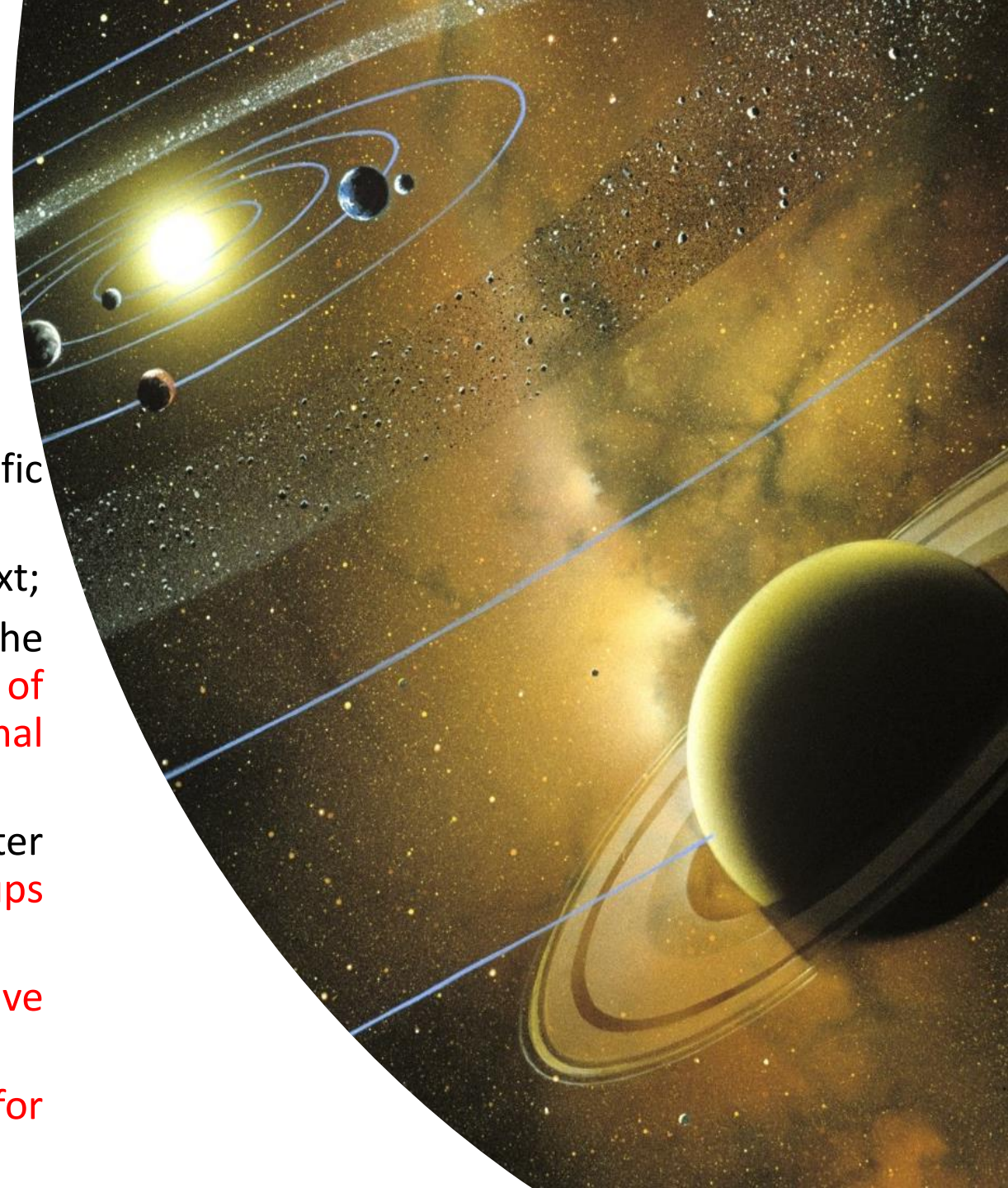


Research activity for the national scientific community in the field of

Sun, Solar System and Exoplanets

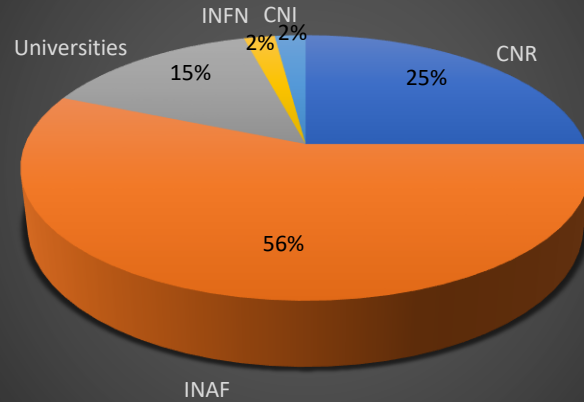
This initiative aims to support the national scientific community to:

- Consolidate the role acquired in the international context;
- Bring together the know-how acquired in the fields of the Sun, the Solar System and exoplanets in a **network of competences distributed throughout the national territory**;
- Stimulate the national scientific community to foster **synergies between complementary research groups** according to common scientific objectives;
- Promote the study and development of **innovative concepts**;
- Provide guidance for the definition of the **roadmap for the next 15 years**.



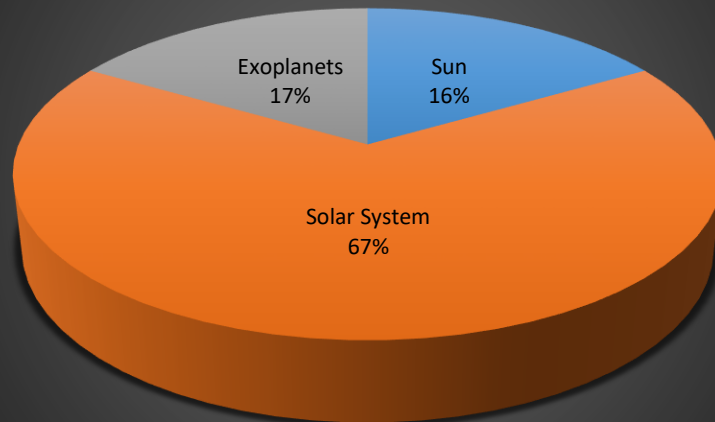
Sun, Solar System and Exoplanets

Submitted Projects

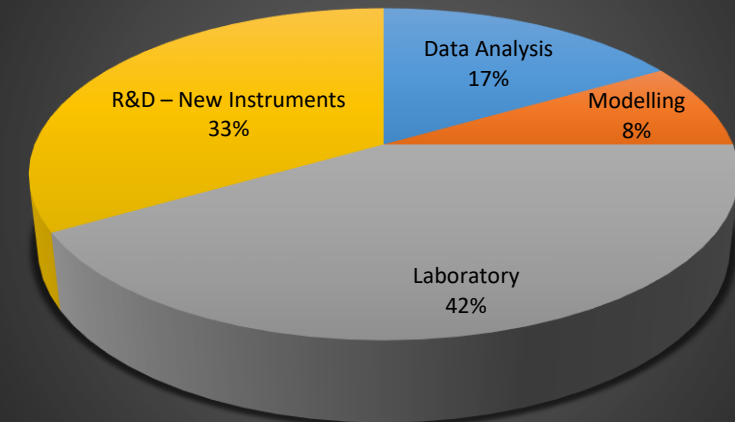


	CNR	INAF	Universities	INFN	National Inter-University Consortium	Total
Submitted projects	12	27	7	1	1	48
Funded projects	3	7	1	1	0	12
Success rate	25%	26%	14%	100%	0%	25%

Funded projects



Funded projects

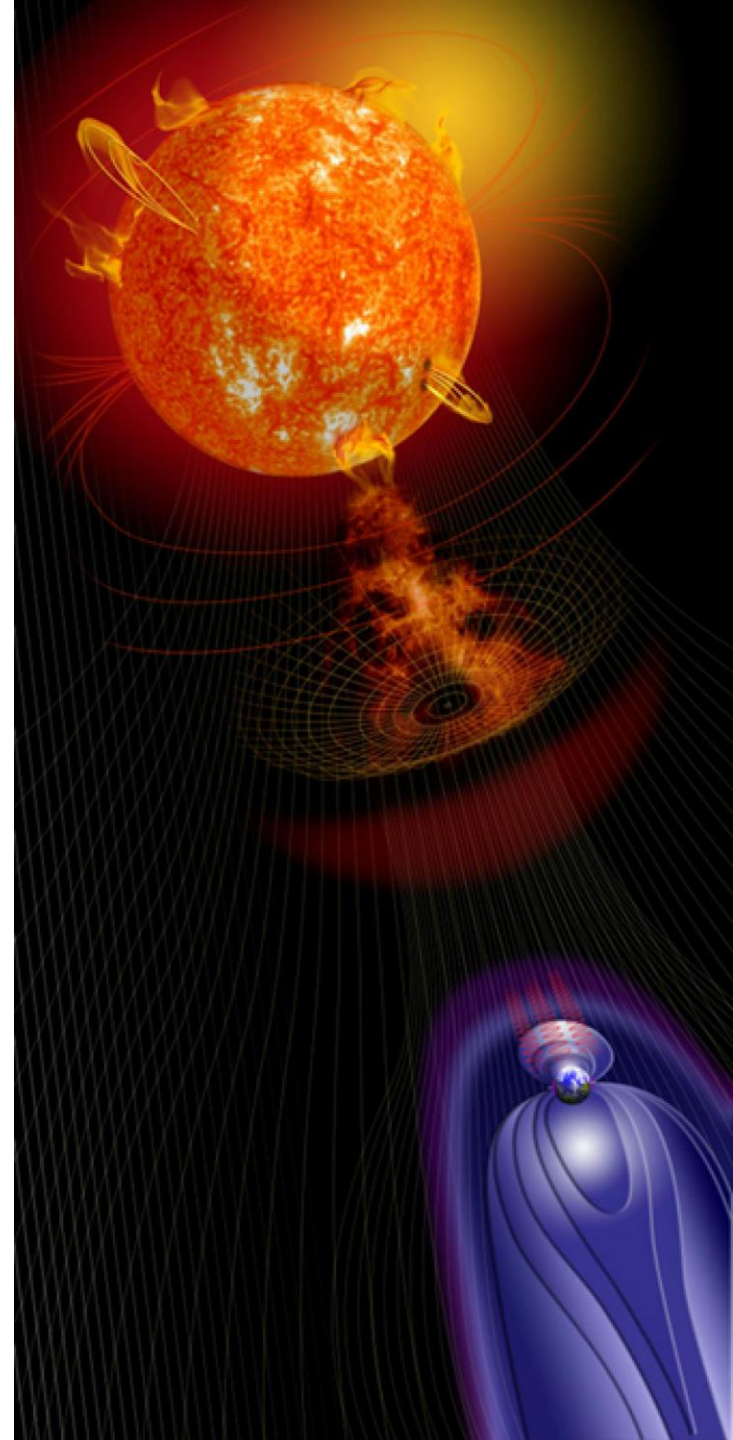


Research activity for the national scientific community in the field of **Space Weather**

Creation of a prototype scientific centre for the collection, processing and distribution of Space Weather data already available to the Italian scientific community, called **ASPIS** (ASI Space Weather InfraStructure), to be built at the ASI Space Science Data Centre (SSDC).

36 months

To be concluded end of January 2024



Toward an Italian roadmap for the Moon

Two national surveys to collect the scientific interest and the relative payload that the Italian scientific community can offer in the field of lunar exploration:

- INAF led white paper for lunar exploration;
- ASI workshop: *“Una roadmap per la Luna: Scienza e Tecnologia”*

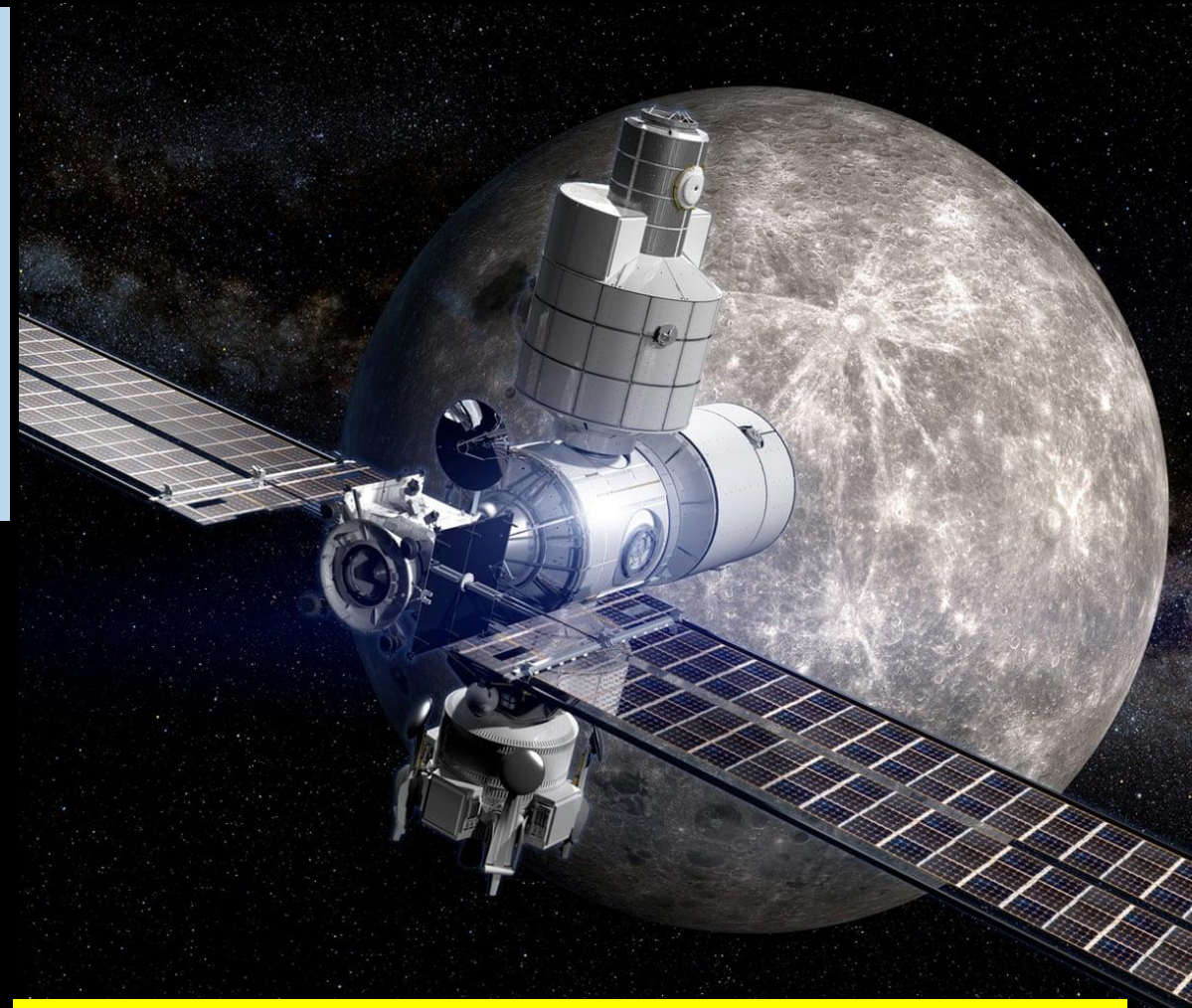
This is a first step toward the definition of an Italian roadmap for lunar exploration.

Una Roadmap per la Luna: Scienza e tecnologia

1 Febbraio 2022 @ 11:00 - 3 Febbraio 2022 @ 17:00



Dal 1 al 3 febbraio 2022 presso la sede dell'ASI. Scadenza sottomissione abstract: 22 novembre 2021



Part of the ideas explored in these surveys will be realised in PNRR or ASI projects

Earth – Moon – Mars (EMM) PNRR Infrastructures project

FUNDED

Objectives and ambition

The EMM objectives will be articulated in different activities (WPs), which mainly foresee:

- the creation of a new infrastructure for the deep space network (SRT/DSN);
- A phase A study of a lunar infrastructure and its connection with the ground segments;
- the improvement of TRL of scientific payload to be accommodated on the lunar infrastructure in the next future;
- the designing, prototyping and testing of instruments at lower TRL to improve their maturity in perspective of a longer-term plan for further accommodation on the lunar surface;
- the development of a multidisciplinary research network aimed at sharing tools, data and expertise for a joint study of the Earth and Mars.



INAF contribution related to payload development

The High TRL instrument to be developed are:

- **Lunar Electromagnetic Monitor in X-rays (LEM-X)** - scientific responsible: Dr. Marco Feroci, INAF-IAPS
- **LUNAr optical POLarimeter surveyor (LUNAPOL)** - scientific responsible: Prof. Paolo De Bernardis, Univ. Roma "La Sapienza", associated INAF-IAPS
- **PANoramic CAMera (PANCAM)** - scientific responsible: Dr. Claudio Pernechele, INAF-OAPD

Total budget for INAF: ~ 5.9 Meuro

The Low TRL instrument to be developed are:

- **Lunar Italian Spring Seismometer (LISS)** – scientific responsible: Dr. Francesco Santoli, INAF-IAPS
- **Moon UV Albedo Measurement (MUAM)** – scientific responsible: Dr. Matteo Lombini, INAF-OAS
- **Dust Electrostatic Collector (DEC)** – scientific responsible: Dr. Ernesto Palomba, INAF-IAPS
- **Lunar Dust GRID System (LD GRIDS)** – scientific responsible: Dr. Carmen Porto, INAF-OACN
- **Solar X-Ray MOONitor (SXRM)** – scientific responsible: Dr. Silvano Fineschi, INAF-OATO

Earth & Mars research network development

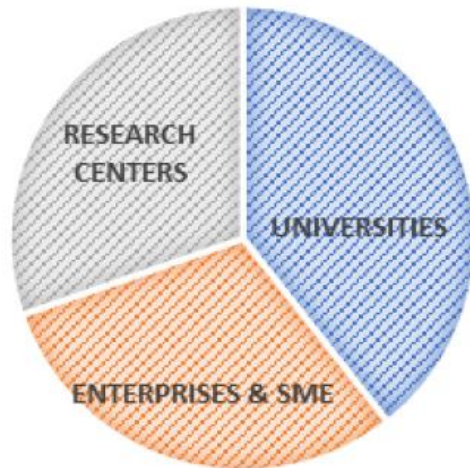
- Martian facility for sand and dust mobilization phenomena: planetary images, laboratory experiments and terrestrial analogues. – PIs: Drs. G. Franzese / S. Silvestro / G. Mongelluzzo
- WP1500-13 Laboratory of molecular spectroscopy in planetary atmospheres. – PI: G. Piccioni / M. Snells

ASI Extended Partnership – Space: SPACE IT UP



UNIVERSITIES										EPR			OTHER RESEARCH CENTERS			INDUSTRIES														
POLITO	POLIMI	UNIroma1	UNIPD	UNITN	GSSI	UNIBO	UNIP1	POLIBA	UNIFI	UNIroma2	CNR	INAF	INFN	INGV	INRIM	IIT	CMCC	ENEA	FBK	LEONARDO	TELESPAZIO	TAS-I	ALTEC	E-GEOS	CIRA	SITAEL	ARGOTEC	TYVAK	MAPSAT	
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	8	L		•	•	•		•	CL		•	•	•				•	•		•	•	•	•	•	•	•	•	•	•	•
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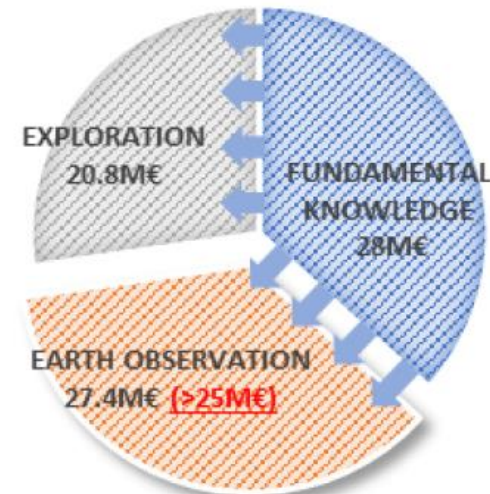
N° OF PARTNERS



TOTAL BUDGET



RESEARCH AREAs SHARE



Proposal submitted on 30/09/2022
 First phase decision expected: May 2023
 Tot budget assigned to INAF: 5.6 Meuro

Where we are, where we are going

WHERE WE ARE

- Fully operative missions with important INAF contribution: Solar Orbiter, Mars missions: ExoMars/TGO, Mars Express, MRO
- Recent launched mission with important INAF contribution:
 - JUICE (launched: 14/4/23 - arrival 2031 - 8 years)
 - BepiColombo (launched 10/2018- science phase at Mercury in 2026)
- Analysis of samples returned by Hayabusa 2
- Mission just concluded or close to conclusion: LICIACube, Juno

WHERE WE ARE GOING

- New developments with missions to be launched in the middle and end of 2020's:
 - small experiments and/or HW contributions and/or maintenance/refurbishment/re-flight of payload (ExoMars) or scientific participation
- Development of new technology and new ideas

Where we are, where we are going

WHAT WE NEED TO FOCUS ON / KEY DRIVERS

- Strengthen the interlocution with ASI (scientific vision, strategic choices):
 - participation in ASI (and ESA) support study groups, workshops, WGs to define roadmaps
- Need to keep the teams and acquired skills alive while awaiting the arrival of major missions
- Take advantage of the many current opportunities for the development of new ideas, and new technologies (PNRR, space partnership, ASI studies, ASI calls for new ideas, that will lay the foundation for the future)
- New trends: small fully Italian missions, miniaturised / integrated / compact instrumentation, techniques and studies for the exploration and scientific exploitation of the Moon, support to space missions through ground-based observations, laboratory and field experiments, improved modelling

SCIENTIFIC CHALLENGES FOR THE NEAR FUTURE

- Moon
- Mars Sample Return
- Small bodies and satellites exploration and sample return
- Ocean worlds
- New Technologies for Studying the Sun and Space Weather