Lo studio del nostro Sistema Solare nel futuro dell'INAF

Luna e Marte

Francesca Esposito e Fabrizio Capaccioni

Riunione Raggruppamento Scientifico Nazionale 3
Napoli 18-19 Ottobre 2022

INAF
ISTITUTO NAZIONALE DI ASTROFISICA

Mars exploration and study @ INAF today

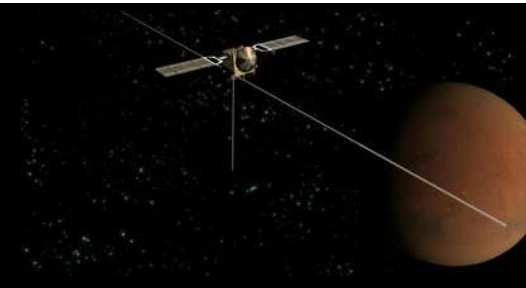
- Operations of payload in on-going missions (Mars Express, MRO, ExoMars-TGO)
- Maintenance of payload in stand-by missions (ExoMars 2022: Ma_MISS, MicroMED)
- Preparation to operations of ExoMars 2022 (sample preparation and analysis)
- Development an upgrade of Martian simulation facilities
- Field test in Martian analogue sites (deserts)
- Laboratory characterization of analogue materials (see Brucato-Palumbo presentation)
- Landing site characterization from remote data
- Simulation of operations in cruise, commissioning phases and at Mars
- Preparation to Mars Sample Return

Numero di Persone Coinvolte	INAF	ASSOCIATI
TOT (TI/Non-TI)	50	25

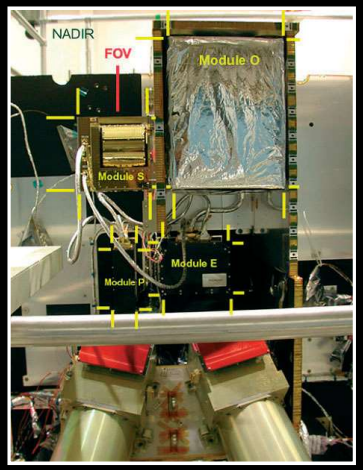
Finanziamento totale INAF:
~ 16 M€

Coinvolgimento e Leadership INAF

MEX (lanciata nel 2003, operativa)



PFS



PIship: INAF IAPS

Spettrometro di Fourier ottimizzato per studi atmosferici, intervallo spettrale 1,2-50 cm^{-1}, sampling ~1 cm^{-1}. Ha prodotto il dataset più completo e longevo di parametri atmosferici di Marte ed è stato il primo strumento a rilevare la presenza di metano su Marte. È stato in buona parte realizzato e interamente assemblato nei laboratori ex-IFSI (ora IAPS).

OMEGA

Co-PIship: INAF IAPS

Spettrometro ad immagine, intervallo spettrale 0.4-5.1 μm, sampling ~15 nm . I sui dati hanno rivoluzionato la nostra comprensione dell'evoluzione di Marte. Ha prodotto mappe composizionali globali di Marte per studiare minerali, ghiacci e fenomeni atmosferici. Il canale VNIR è stato interamente realizzati nei laboratori ex-IFSI (ora IAPS).

MARSIS

PIship: INAF OAS

MARSIS è un radar dotato di una antenna lunga 40 m che invia onde radio di bassa frequenza verso Marte per sondarne il sottosuolo fino a profondità di alcuni km. I suoi obbiettivi scientifici primari sono l'analisi della superficie, del sottosuolo e della ionosfera di Marte. Il radar MARSIS ha cominciato ad operare nel giugno 2005.

MRO SHARAD

(lanciata nel 2005, operativa)

Respons. Scientifica: INAF IAPS - OAS

SHARAD è un facility instrument dell'ASI per la missione MRO. E' un radar altimetro ad apertura sintetica a bassa frequenza in grado di penetrare nel sottosuolo (< 2 km), complementare a MARSIS, avendo una maggiore risoluzione spaziale per studiare degli strati più prossimi alla superficie.

Coinvolgimento e Leadership INAF

TGO-ExoMars2016

(lanciata nel 2016, operativa dal 2018)

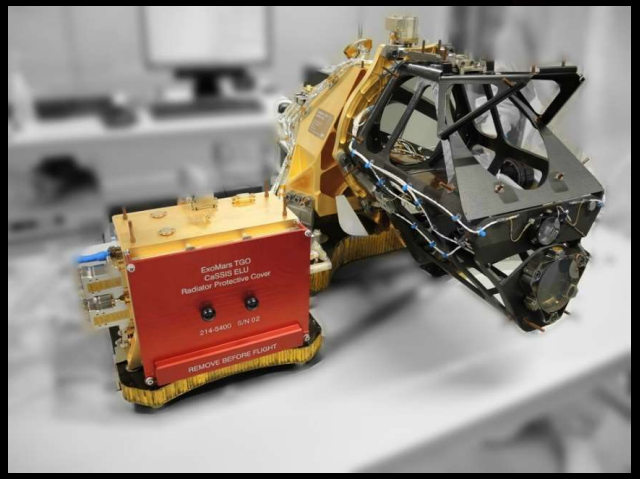
CaSSIS

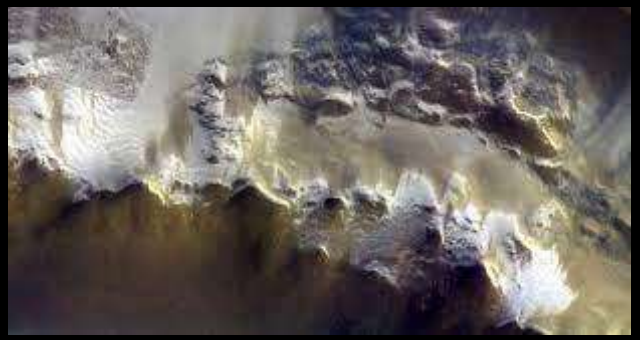
Co-PIship: INAF OAPD

CaSSIS la stereo camera a bordo della missione Exomars TGO in orbita operative intorno a Marte dall'April 2018.

Il detector è uno spare model delle camere di SIMBIO-SYS/ BepiColombo per Mercurio.

Finora CaSSIS ha acquisito più di 20.000 immagini e 2.000 coppie stereo, con dettaglio spaziale di 4.6 m/px. Un'immagine tipica full color ha una dimensione di 9.5x45 km.





NOMAD

Co-PIship: INAF IAPS

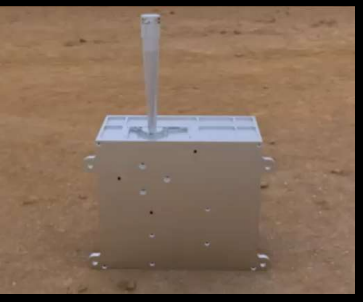
NOMAD è una suite di spettrometri a bordo della missione congiunta ESA-Roscosmos ExoMars Trace Gas Orbiter (TGO) che sta studiando la composizione e la distribuzione delle specie minori nell'atmosfera di Marte (trace gases) con un dettaglio senza precedenti. Lo strumento è composto da tre canali che coprono l'intervallo spettrale dall'UV all'IR in configurazione "solar occultation", "nadir" e "limb". NOMAD è stato progettato per studiare le concentrazione dei gas meno abbondati nell'atmosfera di Marte ma che hanno forti implicazioni per ricostruire la sua storia passata (H2O/DHO) e il suo potenziale astrobiologico (metano).

Coinvolgimento e Leadership INAF – ExoMars2022

Piattaforma di Superficie (PS)

MICROMED

PIship: INAF OACN
Sensore per la misura di dimensione e abbondanza delle particelle di polvere nell'atmosfera marziana → feedback su clima, processi eolici, tempeste di polvere, dust devils.
E' uno dei sensori della suite russa *Dust Complex (***CoPI-ship: INAF OACN***)* integrata sulla PS.



MOMA

Responsabilità Scientifica: INAF OAA
Analizzerà molecole organiche complesse presenti suolo/ sottosuolo marziano ed è quindi lo strumento che più direttamente risponde agli obiettivi scientifici della missione ExoMars 2022.

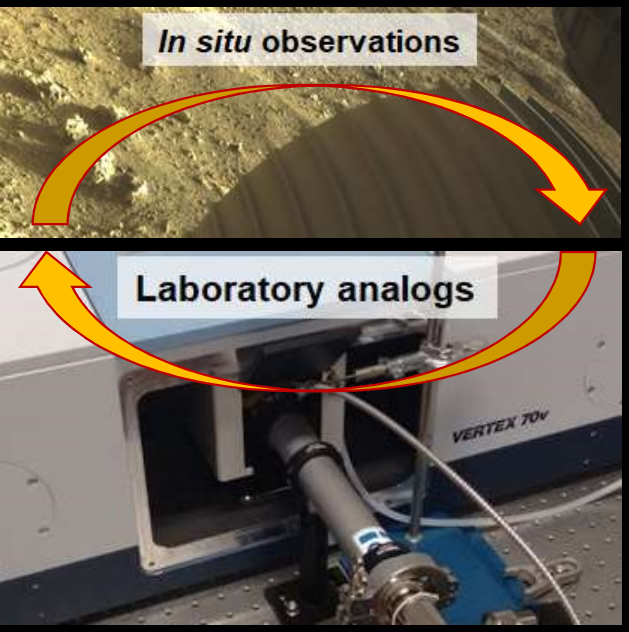
Rover (R)

Ma_MISS

PIship: INAF IAPS
Spettrometro VIS-IR modulare e miniaturizzato, integra nel trapano (DRILL TOL del Rover per:
- Ricavare la composizi della stratigrafia nel sottosuolo (fino a 2 m)
- Caratterizzare l'ambi da cui vengono prelev i campioni di interesse astrobiologico e ridefinire i criteri per la loro selezione.

INAF ha inoltre Co-Iships in: CLUPI (R), PANCAM (R), WISDOM (R)

Mars2020 & MSR



Mars2020

Responsabilità Scientifica:
INAF OAA

Il progetto supporta l'analisi e interpretazione delle osservazioni spettroscopiche del rover Perseverance/Mars 2020 (NASA) per identificare molecole organiche e potenziali biosignature molecolari nel suolo marziano, sia attraverso un contributo alle operazioni scientifiche del rover che attraverso simulazioni di laboratorio dell'ambiente marziano per valutare lo stato di preservazione di eventuali organici e distinguere la loro possibile origine abiotica o biotica. Questa attività aiuterà inoltre a selezionare i migliori campioni marziani da riportare sulla Terra in una possibile futura missione di SR.

Coinvolgimento e Leadership INAF

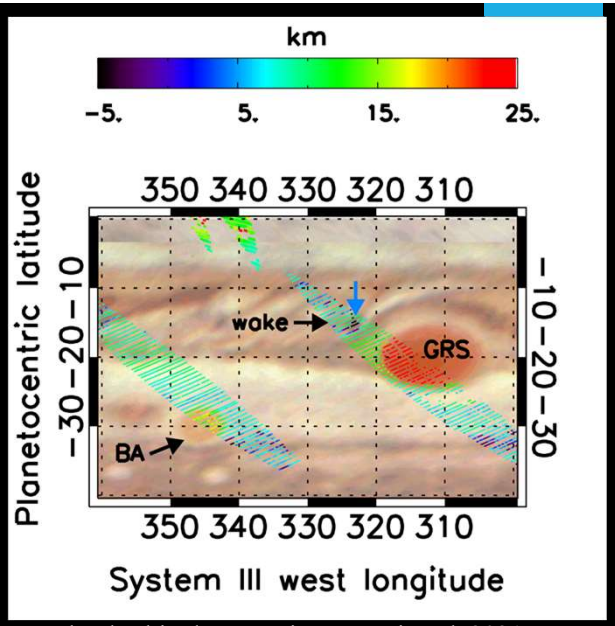
Mars Sample Return (MSR)

Responsabilità Scientifica:
INAF IAPS

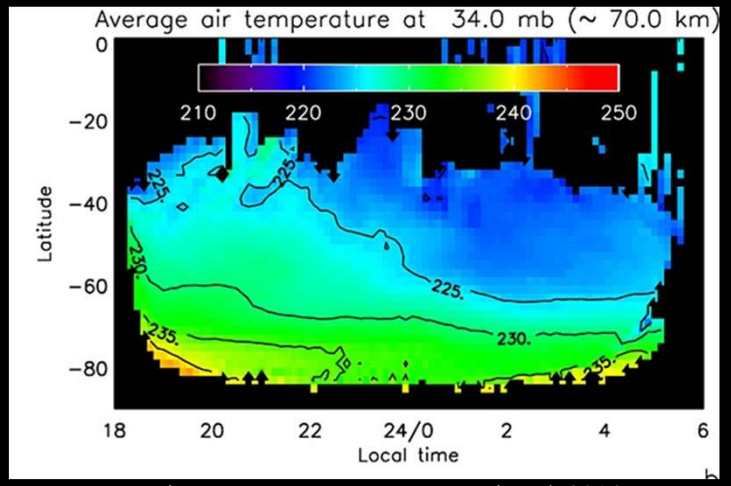
Mars 2020 raccoglierà per la prima volta campioni che dovranno essere riportati a Terra entro il 2031 con una campagna di missioni NASA/ESA di MSR. I campioni saranno analizzati in laboratori specializzati per identificare la presenza di vita. Obiettivo di questo progetto è costruire delle solide collaborazioni fra le comunità scientifiche/tecnologiche italiane interessate al MSR per essere il più competitivi possibile nella prossima frontiera dell'esplorazione di Marte.

Mars science: a long-term heritage

- The need to exploit Mars spectral data has created - since the inception of the Mars Express mission - a robust <u>expertise</u> on
  - Radiative Transfer
  - Optimal inverse methods
  - as applied to infrared (and visible) remote-sensed data of **planetary atmospheres**.
- "Martian" codes have been successfully adapted to the study of Venus and Jupiter, and represent <u>an INAF scientific asset for its partecipation in JUICE and future missions to icy giants</u>
- This expertise is mostly based in IAPS. Key role has been played by the long-term collaboration with IKI, Moscow, still ongoing despite current situation



Clouds altitude on Jupiter, Grassi et al, 2021



Air temperature on Venus, Grassi et al, 2014

Field Activities

The OACN planetology science team
(F. Esposito, F. Cozzolino, G. Franzese, G. Mongelluzzo, C. Popa, C. Porto, S. Silvestro**)**
has performed a dozen of field missions in the Sahara desert of Tafilalt region (Morocco)
deploying a fully equipped meteorologial station
with a camera set up to monitor the surface grain mobilization

Field missions are and will be financed trough the DREAMS and MicroMED projects, various EuroPlanet-Horizon2020/4 grants and an INAF mini grant

Main purposes are

Test of Martian space instrumentation in a representative scenario:

DREAMS station
on board of ExoMARS 2016
&
MicroMED sensor
on board of ExoMARS 2022

Study of martian analogues phenomena

Aeolian sand and dust mobilization:
dust storm - dust devil

Aeolian landforms:
dunes - ripples and wind streaks

to study:

threshold for grain lifting and the grain electrification processes

interpretation of present and past wind regime
information on the climatic conditions

Martian Atmosphere Simulation Chamber

Cylindrical chamber with size: 1.34m x 2.09 m.
It is able to reproduce the Martian atmosphere in terms of :
(Cozzolino, F. et al 2020)

- Pressure 6-8 mbar.
- Chemical Composition (CO_2 95% ; N 2.6 % ; 2 % Ar).
- Presence od Dust in the range size 0.2-50 μm.
- Temperature can vary from -20 to + 50 ° C

The Martian Atmosphere Simulation Chamber is placed inside a clean room to test and calibrate flight instruments.

The simulation chamber has been used for testing and calibration of **MicroMED** sensor.

ExoMars status

- After the suspension of the mission in March due to the Ukrainian and international crisis, a phase A study began to identify a new scenario to save ExoMars mission.
- This study identified a recommended approach based on a launch in 2028 with 2030 back-up.
- It assumes a European Lander combined with additional support from NASA with the delivery of key mission elements, including the launcher.
- NASA contributions were set out in the Statement Of Intent signed in June between NASA and ESA.
- The ESA Restricted Council that met on 12 July 2022 decided to:
  - Terminate 2022 ExoMars RSP cooperation with Roscosmos
  - Requested the Executive to analyse the Science case for recovery of the Rover mission, to propose a range of options for this mission, to proceed with maintenance and Schedule Protection Activities to allow a decision to be taken at CM22

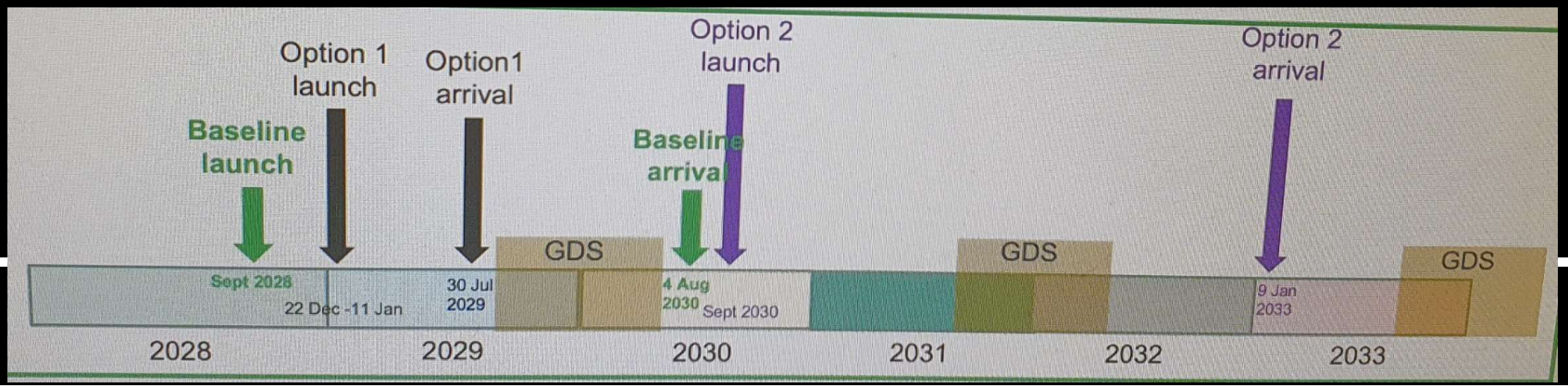
ExoMars status

- The Executive has prepared for October Council (19/10) an options paper to set out the pros and cons of 4 possible scenarios:
  - **Zero Option** – End operations of the Trace Gas Orbiter and abandon efforts to land the Rosalind Franklin rover on Mars
  - **Option 1** – Continue operations of the TGO but abandon efforts to land the Rosalind Franklin rover on Mars
  - **Option 2** - Continue operations of the TGO and implement a mission to land the Rosalind Franklin rover on Mars at the earliest date and lowest cost
  - **Option 3** – Continue operations of the TGO and implement a mission to land the Rosalind Franklin rover on Mars with a different context e.g. adding additional science or technological innovation to the mission; delaying the launch date; or seeking international partners other than NASA to participate in the mission.
- The Executive has recommended Option 2.
  For this scenario, additional required funds will be taken from those foreseen for the MSR Fetch Rover, that is now cancelled (due to new mass evaluations).
- Most Delegations have expressed positive support, including larger contributors I and UK, while support from D and F is still being debated.
- At the moment all ExoMars Elements (Carrier, Descent Module, Rover, the Surface Platform) are stored at TASI premises.

ExoMars status

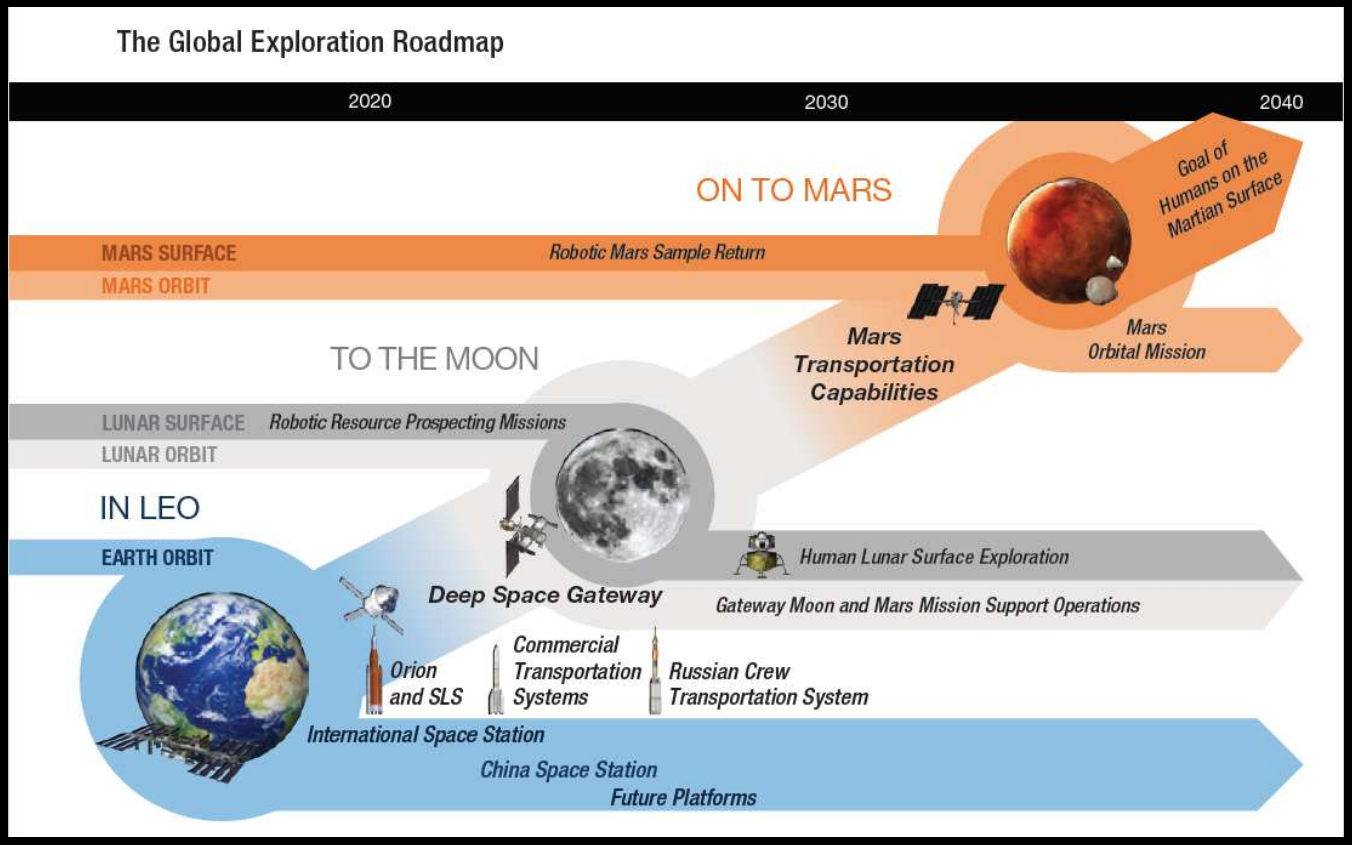
New mission scenario

	Mission Prime	Launch service	Carrier Module	Descent Module	Rover Module	Landing Platform
						
ExoMars Launch in 2022	**ESA** TAS-I	**ROS** Proton	**ESA** OHB-DE	**ROS** with ESA subsystems (e.g. Radar and Parachute system)	**ESA** 7 ESA instruments 2 RUS instruments ROS RHUs Airbus-UK, TAS-I OHB-DE, LNDO-IT AMELIA descent science	**ROS** Long life platform 11 RUS instruments 2 EUR instruments
Rosalind Franklin recovery mission Launch in 2028	**ESA** TAS-I	**US** Falcon Heavy or Vulcan	**ESA** OHB-DE	**ESA** Reuse of existing technology + competitions for new elements **US braking engines**	**ESA** 7 ESA instruments **US RHUs** Airbus-UK, TAS-I OHB-DE, LNDO-IT AMELIA descent science	**ESA** Short life only for rover egress Competitions for new elements EDL monitoring payload



Moon exploration and study @ INAF today

In 2018 and 2020, the major Space Agencies in the world published the **Global Exploration Roadmap (GER)**, where their share the common intent to expand the human presence into the Solar System with the surface of Mars as driving goal and the Moon as a necessary intermediate step.



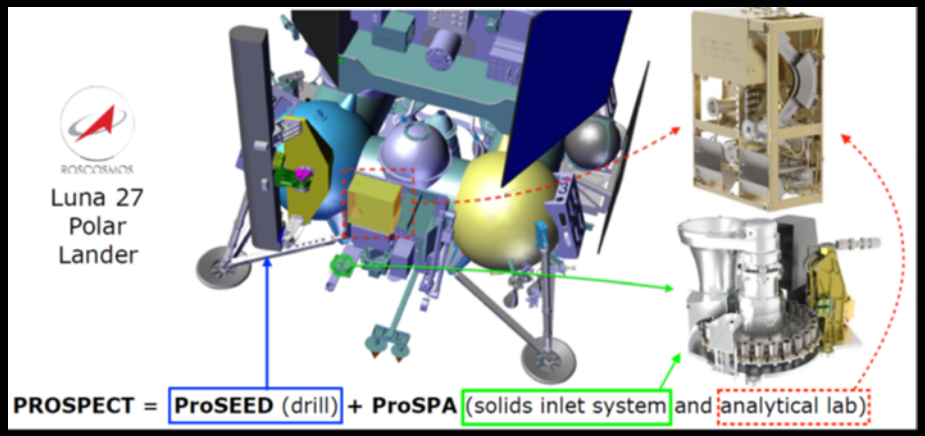
> 30 robotic missions to the Moon (from 13 Countries and from both Space Agencies and Private Companies) and 4 crewed have been already approved and are under development in 2021 - 2028 period.

> 20 missions (robotic and crewed) have been proposed and waiting for evaluation.

Moon exploration and study @ INAF today

Participation to the ESA PROSPECT Payload

M. C. De Sanctis[1], J.R. Brucato [2], M. Formisano[1], G. Cremonese[4], M. A. Corazza [2], S. De Angelis[1], M. Ferrari[1], T. Fornaro[2], A. Meneghin[2] - [1]IAPS, Roma; [2]OAA, Firenze; [4]OAPd, Padova



- PROSPECT is a suite of instruments for accessing and analyzing the Lunar resources. It is also devoted to the preparation of enabling technologies that could be used to extract these resources in the future.
- The development of the **PRO-SEED (PROSPECT Sample Excavation and Extraction Device) drill is led by Leonardo, Italy.**
- The development of PROSPECT's ProSPA (PROSPECT Sample Processing and Analysis) chemical laboratory is led by the Open University, UK.
- The **Science Team** is composed by a wide group of scientists from Europe and USA, selected by ESA in response to a Call for selecting the Science Team (Ref. ESA-HRE-PROSPECT-AO-0001).
- Initially developed for flight onboard Russian Luna-27 mission (2025) is now part of the cooperation with NASA on CLPS missions.

Moon exploration and study @ INAF today

Participation to the ESA Lunar missions under study.

ESA has several missions under study:

Candidate Mission Concepts

EL3 Cargo Logistics

Scientific Mission Candidates: post 2030

- Polar Explorer (CDF complete, pre-Phase A with Primes)
- Astrophysical Lunar Observatory (ALO) – CDF complete
- Bioscience on the Moon (BioMoon) - CDF complete
- Geological Exploration Mission (Lunar GEM) -Internal study ongoing;

Many of us are involved in those studies.

Moreover, different payloads have been proposed to the last ESA call for ideas for the Moon.

INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

ROMA TRE UNIVERSITÀ DEGLI STUDI

UNIVERSITÀ DEGLI STUDI DI PADOVA

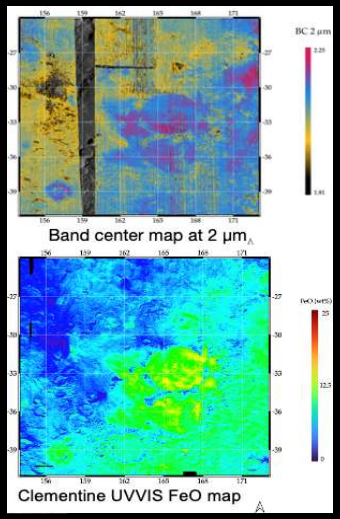
UNIVERSITÀ DEGLI STUDI FIRENZE

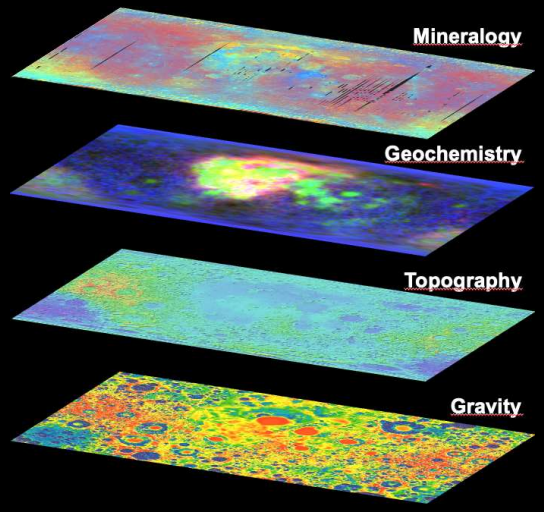
UNIVERSITÀ DEGLI STUDI DI TRIESTE

PI: F. Tosi, IAPS

MELODY: A PRIN INAF project to address key open question left by past lunar exploration

Multisensor data analysis of specific ROIs



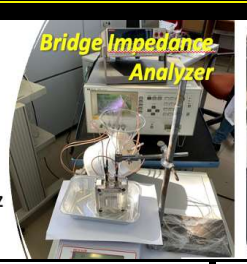


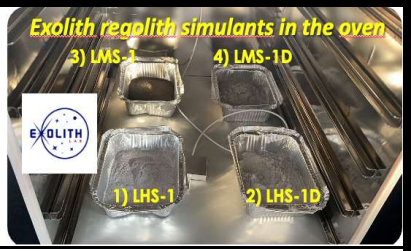
Electromagnetic characterization of lunar regolith simulants

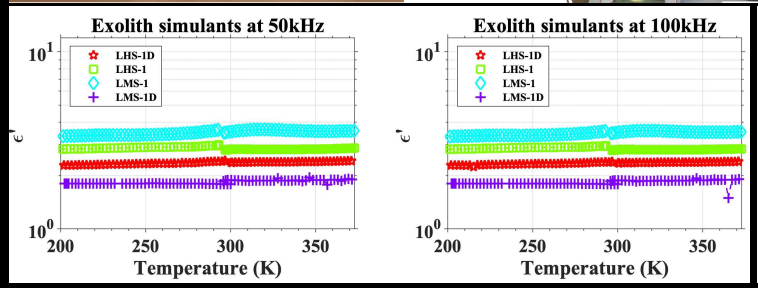
Frequency domain:

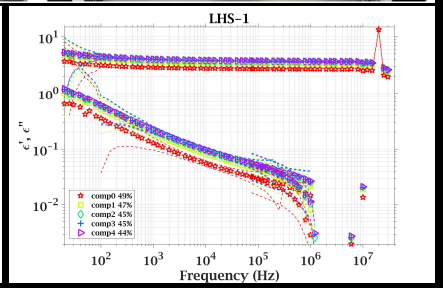
20Hz - 1MHz (HP4284A)

75kHz - 30 MHz (HP4285A)

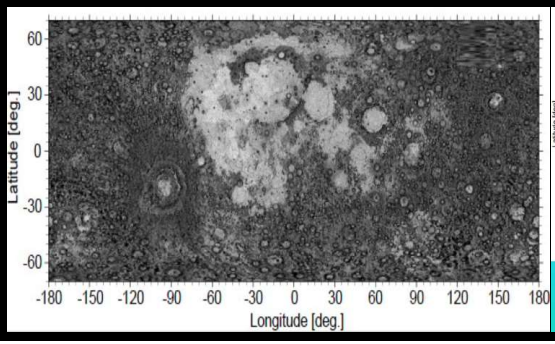


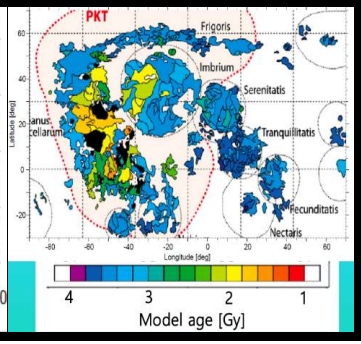




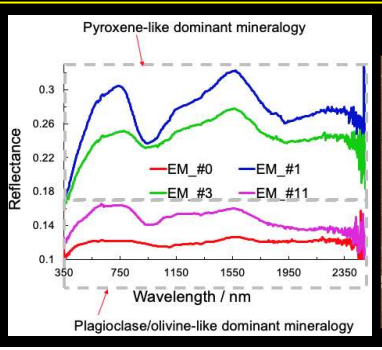


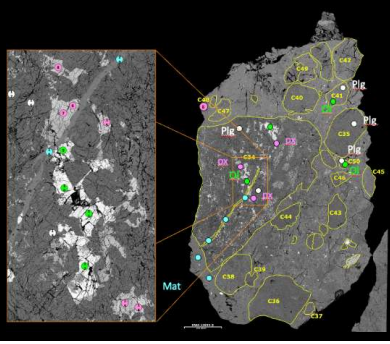
Reanalysis of lunar radar data with new techniques





Mineralogical and geochemical characterization of lunar meteorites



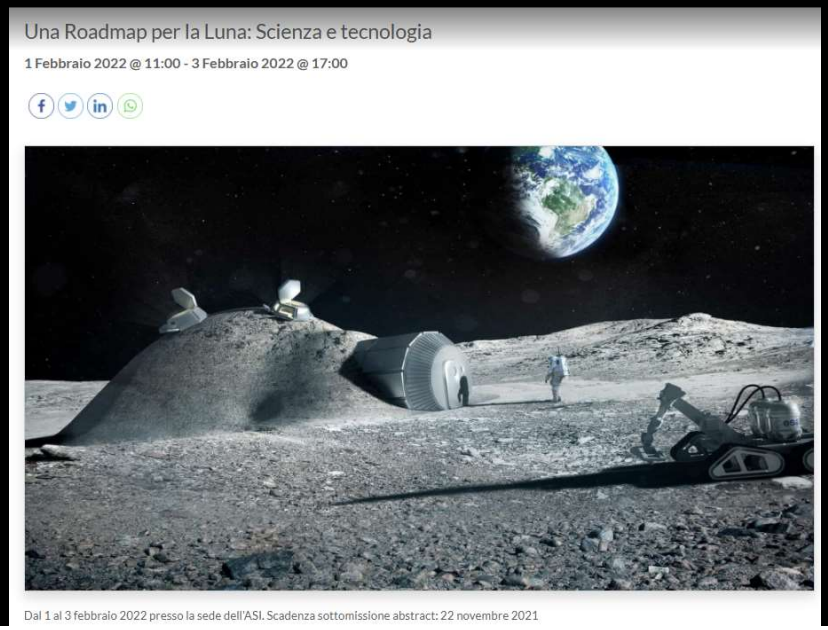


Toward an Italian roadmap for the Moon

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.



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

Earth – Moon – Mars (EMM)
PNRR Infrastructures project

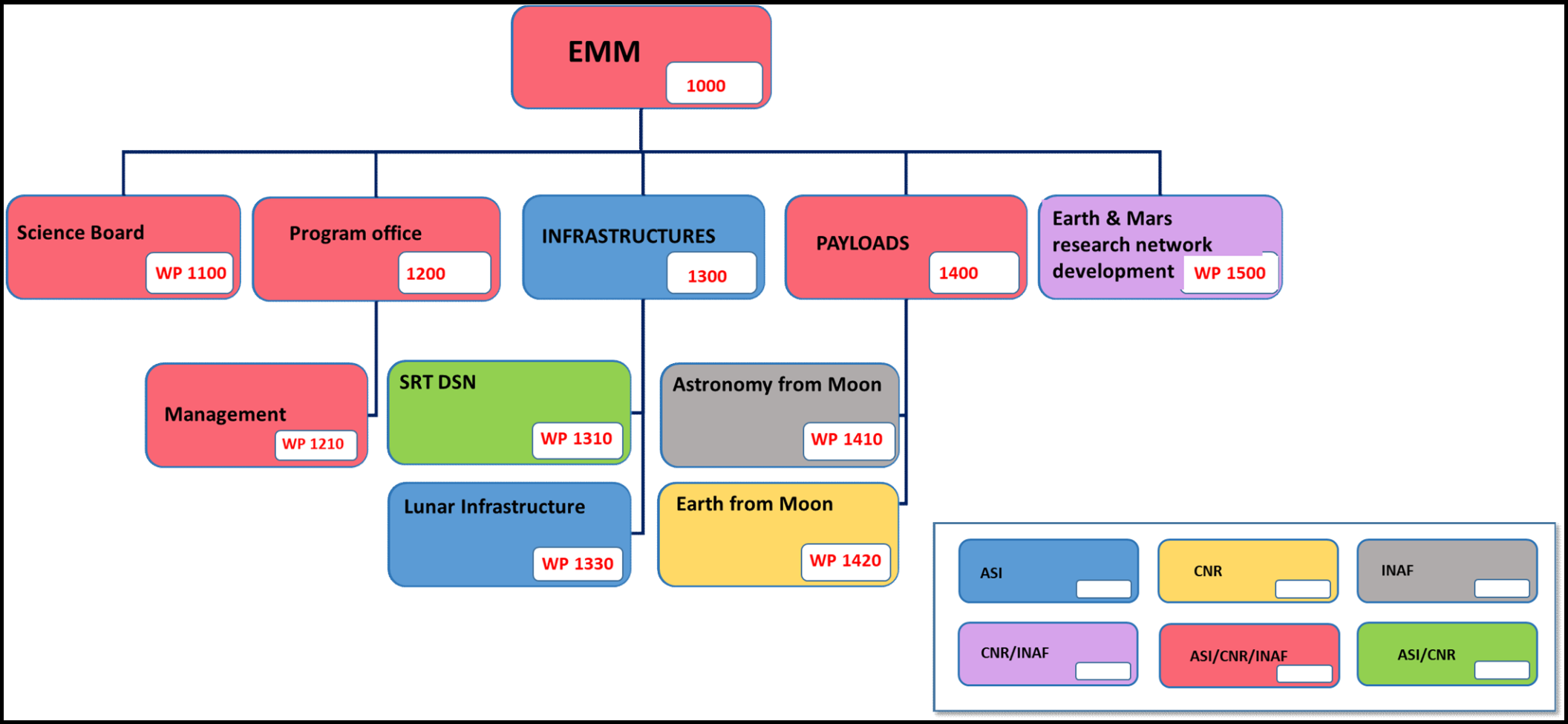
FUNDED

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);
- the planning of a lunar infrastructure and its connection with the ground segments;
- the development of the EM of the instruments with mature technology 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.

EMM – Work Breakdown Structure



INAF contribution related to payload development – WP 1410

- This WP is devoted to the activities related to prototyping and testing of eight instruments to be accommodated on the lunar infrastructure in the next future.
- Each of the eight instruments to be developed has actually a different Technical Readiness Level (TRL) and will reach, during the project, a TRL varying between 4 (Breadboard) and 6 (Engineering Model).

Constraints

- Instrument chosen based on their compatibility with a fixed observatory on the Moon surface.
- Among instruments presented within the *Lunar white paper* and during ASI workshop "*Una Roadmap per la Luna: Scienza e tecnologia*".
- To generally avoid possible overlaps with payload to be proposed in the PNRR PE proposal.
- To allow inclusion of astrophysical payload that cannot fit in any other proposals.
- To consolidate some strategic activities (such as microwave observations) inside INAF.
- To allow as much large as possible involvement of INAF diverse communities. → WP 1100 NEW CALL for Lunar Payload development – allocated budget ~1.9 Meuro

Astronomy from Moon – WP 1410

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:

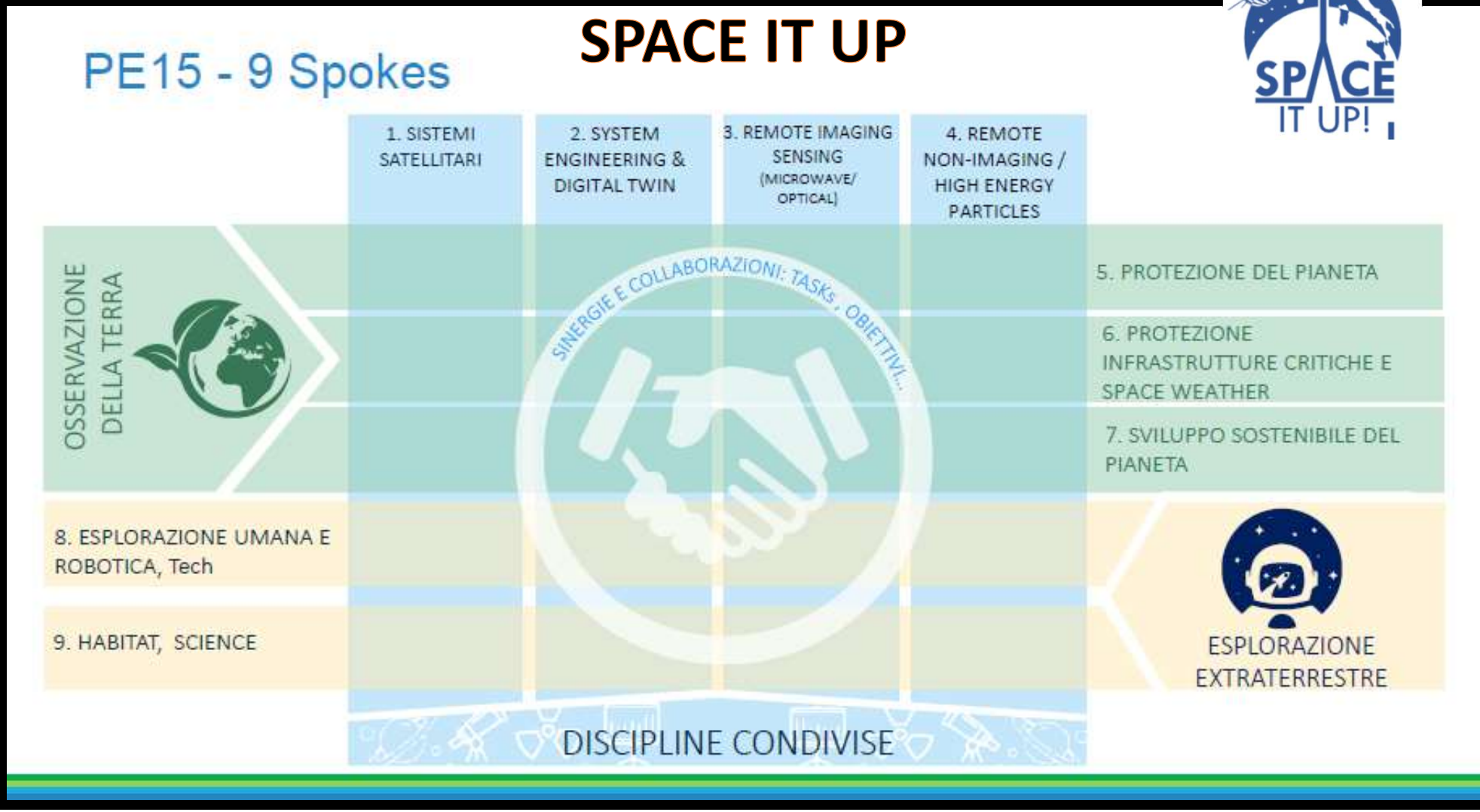
- **Lunar Italian Spring Seismometer (LISS)** – scientific responsible: Dr. Francesco Santoli, INAF-IAPS
- **Moon UV Albedo Measurement (MUAM)** – scientific responsible: Dr. Matteo Lombini, INAF-OAS
- **Dust Electrostatic Collector (DEC)** – scientific responsible: Dr. Ernesto Palomba, INAF-IAPS
- **Lunar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

Earth & Mars research network development - WP 1500:

- WP1500-12 A Martian facility for sand and dust mobilization phenomena: planetary images, laboratory experiments and terrestrial analogues.
- WP1500-13 Laboratory of molecular spectroscopy in planetary atmospheres.

ASI Partenariati Estesi – Spazio:

SPACE IT UP



Distribuzione Enti negli Spokes

	ENTE/SPOKE	1	2	3	4	5	6	7	8	9	TOT
		UNIVERSITÀ									
1	POLITO								L		5
2	POLIMI	L									5
3	Napoli			L							5
4	Roma1		L								5
5	Padova									L	5
6	Trento					L					5
7	SCUOLE				CL			CL			4
8	Bologna								CL		4
9	Pisa	CL									4
10	POLIBA	CL									4
11	Firenze									CL	4
12	Calabria						CL				4
13	Roma2										3
		EPR									
14	CNR			CL				L			5
15	INAF						L		CL		5
16	INFN				L						3
17	INGV					CL					4
18	INRIM										2
19	IIT										2

	ENTE/SPOKE	1	2	3	4	5	6	7	8	9	TOT
		ALTRI ER									
1	CMCC										2
2	ENEA										3
3	FBK										3
4	LINKS										3
		INDUSTRIA									
5	LEONARDO										2
6	TAS-I										6
7	TELESPAZIO										4
8	ALTEC										5
9	E-GEOS										2
10	CIRA										4
11	SITAEL										3
12	OHB										3
13	ARGOTEC										3
14	TYVAK										1
15	MAPSAT										3

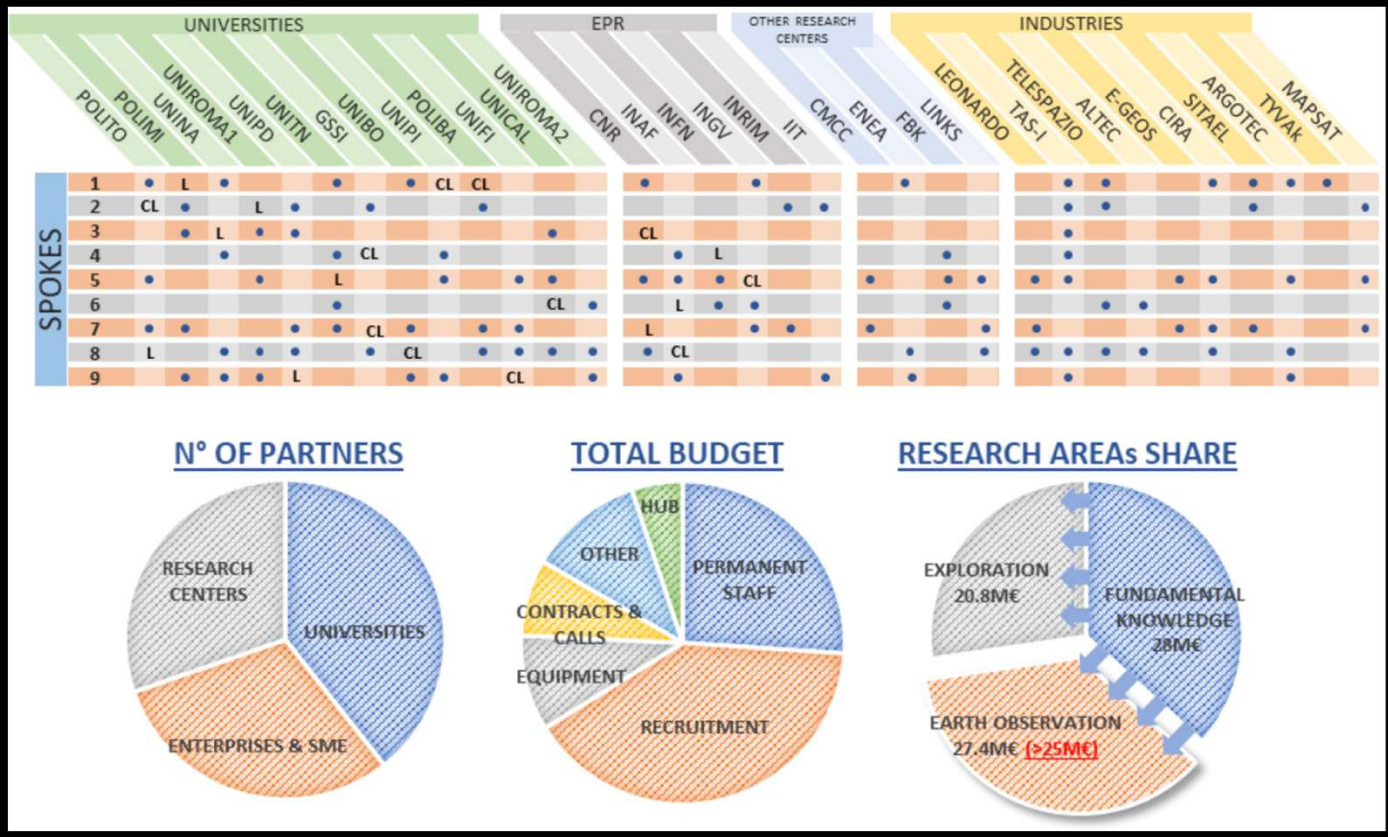
TOTALE ENTI PER SPOKE	1	2	3	4	5	6	7	8	9
	18	15	8	7	18	8	18	20	12

Enti ex Art. 15

	ENTE/SPOKE	1	2	3	4	5	6	7	8	9	TOT	REFERENTE
1	U Palermo										3	POLITO
2	U Parthenope										3	TBD
3	U Roma 3										2	INAF
4	U Pavia										4	U Padova
5	U Vanvitelli										1	U Napoli
6	U Mediterranea										1	U Napoli
7	U Aquila										3	U Trento
8	U Siena										3	INFN
9	U Genova										2	INAF
10	U Perugia										1	INFN
11	U Torino										3	INFN
12	U Insubria										1	POLIMI
13	U Chieti										1	U Firenze
14	U Bicocca										1	INAF
15	U Parma										1	CNR

La tipologia di partecipazione negli spoke definisce il numero di ricercatori che possono essere esposti per ciascun ente:

- Leader (L): espone 7 ricercatori per 3 mesi/anno
- Co-leader (CL): ne espone 5
- Partecipante rafforzato (P*): ne espone 4
- Partecipante (P): ne espone 3



INAF è:

- Leader dello spoke 6: PROTEZIONE INFRASTRUTTURE CRITICHE E SPACE WEATHER
- Co-leader dello spoke 8: ESPLORAZIONE UMANA E ROBOTICA, Tech
- Partecipante rafforzato nello spoke 9: HABITAT, SCIENCE
- Partecipante nello spoke 4: REMOTE NON-IMAGING / HIGH ENERGY PARTICLES
- Partecipante nello spoke 5: PROTEZIONE DEL PIANETA

Proposta sottomessa il 30/09/2022
Budget totale assegnato ad INAF: 5.6 Meuro

Progetti INAF – Habitat extraterrestri

Spoke 8:

1. Sterilizzazione da patogeni di moduli abitabili per habitat extraterrestri.
   Partecipano per INAF: OAS, OAB, OAPd, OACN, IASF-Mi.
   Referenti: Matteo Lombini (PI) – OAS, Giovanni Pareschi (OAB)

2. Set di microrover (per Luna-Marte-asterodi) che lavorano in logica di sciame e che alloggiano una serie di micro-sensori per la ricerca di risorse (acqua principalmente) e lo studio dell'ambiente per la mitigazione dei rischi (polvere ..) + ulteriori sensori e sviluppo tecnologici associati. Sono associati inoltre studi teorici (dinamica polveri) e sperimentali (formazione acqua sulla Luna).
   Partecipano per INAF: OACN, OAPd, OAR, IAPS, OATs, OACt. Partner associati nel PE: UniNA «Federico II», PoliMI, CNR.
   Referenti: Francesca Esposito (PI) – OACN, Gabriele Cremonese – OAPd, Elisabeta Dotto - OAR

Spoke 9:

1. Strategie e metodi diretti per la costruzione di modelli del sottosuolo dei corpi solidi del Sistema Solare. Sviluppo di SW per la produzione di modelli 3D deterministici e stocastici delle superfici planetarie di Luna e Marte.
   Partecipano per INAF: IAPS, OAPd
   Referenti: Federico Tosi (PI) – IAPS, Alessandro Frigeri – IAPS

2. Sviluppo di un nuovo strumento che combini la spettroscopia IR e un dispositivo miniaturizzato per la rilevazione e quantificazione di macromolecole organiche solubili estratte dalle superfici planetarie attraverso l'utilizzo di solventi liquidi.
   Partecipano per INAF: OAA, IAPS, OACT, OAPA, OACN.
   Referenti: John Robert Brucato – OAA, Giancarlo Bellucci - IAPS

Bandi recenti e Nuove opportunità

- Bandi ESA (scaduto 15/09):
  - Reserve Pool of Science Activities for the Moon: A SciSpacE Announcement of Opportunity
  - Reserve pools of Science Activities for ISS: A SciSpacE Announcement of Opportunity
- Bandi NASA:
  - Prism 3 - Uses Commercial Lunar Payload Services (CLPS), specifically with Lunar landers, to conduct automated experiments on the Moon. Proposals due: Step 1 October 24th, Step 2 December 20th.
  - SSERVI CAN 4– Conduct Earth based, team studies related to the Moon. Proposals due: Step 1 October 18th , Step 2 December 15th.
- Bandi ASI:
  - BANDO DI FINANZIAMENTO PER LE “ATTIVITÀ RELATIVE AL SUPPORTO ALLO SVILUPPO DI PROGETTI/ESPERIMENTI SCIENTIFICI NELL’AMBITO DELL’ASTROBIOLOGIA (scaduto 4/10)
  - BANDO DI FINANZIAMENTO DI TOPICAL TEAMS FINALIZZATI ALL’ELABORAZIONE DI PROPOSTE DI PROGRAMMI DI RICERCA O DI ESPERIMENTI SCIENTIFICI SPAZIALI DI INTERESSE NAZIONALE E AD ALTO CONTENUTO INNOVATIVO (revocato – da ribandire)
  - BANDO DI FINANZIAMENTO PER PROGETTI DI RICERCA E SVILUPPO A MEDIO TERMINE RELATIVI ALLE “GIORNATE DELLA RICERCA ACCADEMICA SPAZIALE” (RESEARCH DAY) ASI 2020 AFFERENTI AI TAVOLI TEMATICI “ANALISI DATI E IMMAGINI” E “PROXIMITY OPERATIONS”
  - Bando per payload e tecnologie per missioni lunari (da bandire a breve)