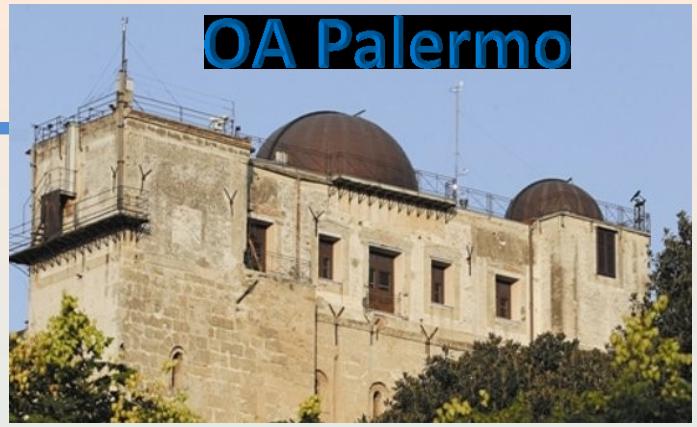
Audizioni INAF 27 Maggio 2021



ASTROLAB

Studio di analoghi e materiali extraterrestri
Programma di ricerca

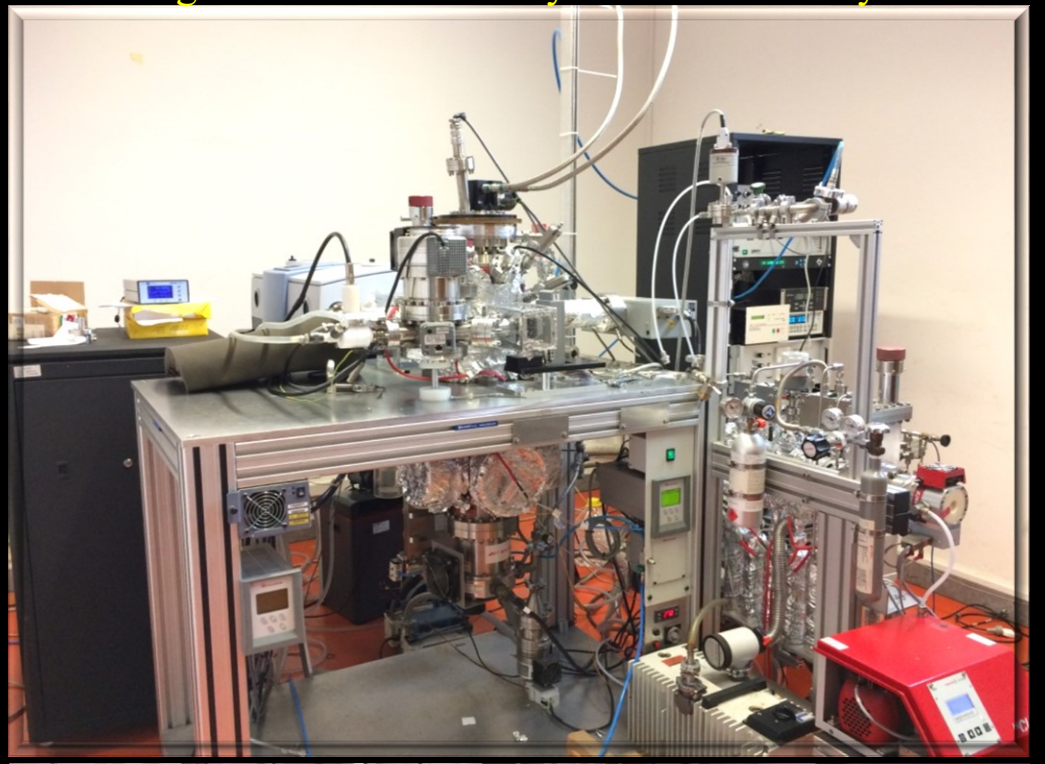
INAF laboratory network

Six laboratories involved in the study of the solid state matter in space

Laboratorio di Fisica Cosmica Capodimonte

Spectroscopy LAB IAPS

LIFE – Light Irradiation Facility for Exochemistry Palermo



Laboratorio di Astrobiologia Arcetri

DUST EVOLUTION IN SPACE

Dust cycling diffuse-dense medium
Time scale 3×10^7 years

Mass Loss

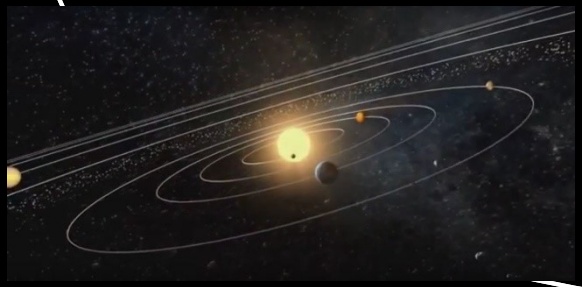
Diffuse Cloud

UV photons: $8 \times 10^7 cm^{-2} s^{-1}$
CR: 2 protons $cm^{-2} s^{-1}$
(1 MeV protons)
H atoms: 8×10^6 atoms $cm^{-2} s^{-1}$
n_H: 50 atoms cm^{-3}

Ice accretion on grains

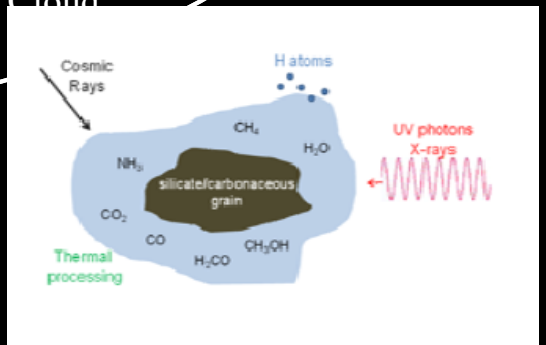
UV photons: 4×10^{-3} $cm^{-2} s^{-1}$
CR: 1 proton $cm^{-2} s^{-1}$
(1 MeV protons)
H atoms: 9×10^4 atoms $cm^{-2} s^{-1}$
n_H: 2 atoms cm^{-3}

Dense Cloud



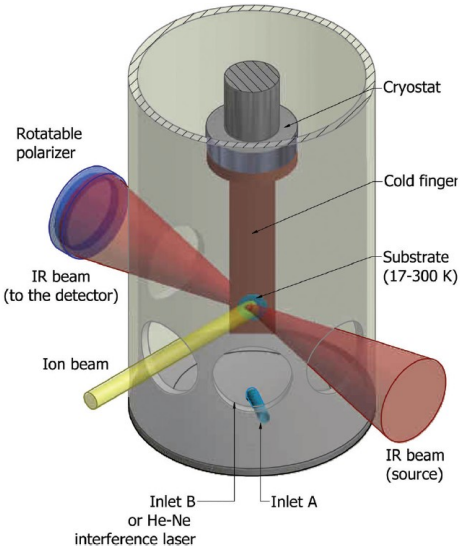
Stellar System

Accretion Disk

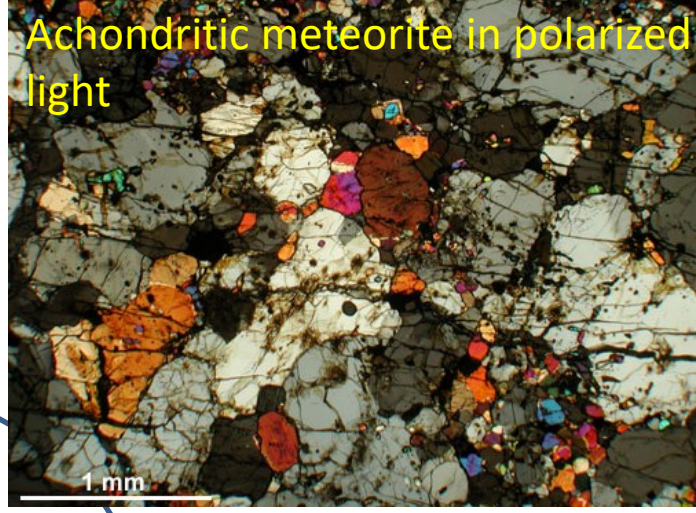


Main analytical techniques

- ✓ UV-Vis-IR- FIR spectroscopy & micro-spectroscopy
- ✓ Raman spectroscopy & micro-spectroscopy
- ✓ Scanning electron & optical microscopy
- ✓ Energy Dispersive X-ray spectroscopy (EDS)
- ✓ Wavelength dispersive spectroscopy (WDS)
- ✓ Mass spectrometry
- ✓ Cromatography
- ✓ Xray diffractometry
- ✓ Laser diffraction analyser



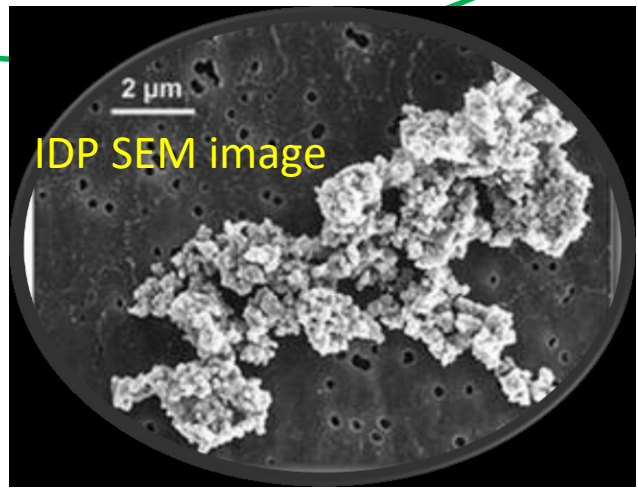
Main research activities



Analysis of extraterrestrial samples
Cometary dust particles collected by Stardust mission
Inteplanetary Dust Particles (IDPs)
Meteorites

Analysis of dust and ice analogs for comparison with observations
Carbon, ices, silicates
Rosetta, Dawn, ISO, Spitzer, etc.

Studies on the evolution driven by processing
Cosmic rays
UV and X-ray photons
Atom irradiation (surface reactions)
Thermal annealing



Research team

People involved in the program: 28 (3 TD)
FTE: 9/YEAR

INAF

OAC	Fabio Cozzolino
OAC	Daniele Fulvio
OAC	Vito Mennella
OAC	Ciprian Popa
OAC	Ernesto Zona
Sez. INAF Lecce	Romolo Politi
IAPS	Cristian Carli
IAPS	Enrico Bruschini*
IAPS	Simone De Angelis
IAPS	Alice Stephant*
Arcetri	John Brucato
Arcetri	Teresa Fornaro
OACT	Giuseppe Baratta
OACT	Giovanni Occhipinti
OACT	Maria Elisabetta Palumbo
OACT	Carlotta Scire
OAPA	Angela Ciaravella
OAPA	Antonio Jiménez-Escobar
OAPA	Cesare Cecchi Pestellini

*TD

INAF associates

Sez. INAF Lecce	Marcella D'elia
Sez. INAF Lecce	Francesca Mancarella*
Sez. INAF Lecce	Vincenzo Orofino
Univ. Firenze	Martina Casalini
Univ. Firenze	Giovanni Pratesi
Univ. Partenope	Alessandra Rotundi
CNR/IPCF	Pietro Gucciardi
CNR/IPCF	Onofrio Marago
INAF	Giovanni Strazzulla

*TD

Funds

PAST ~ 5 M€

5 PRIN MIUR, 2 PRIN INAF, Premiale INAF, ESA, ASI, Regione Campania, Regione Sicilia, Regione Puglia, MAE

CURRENT 506 k€

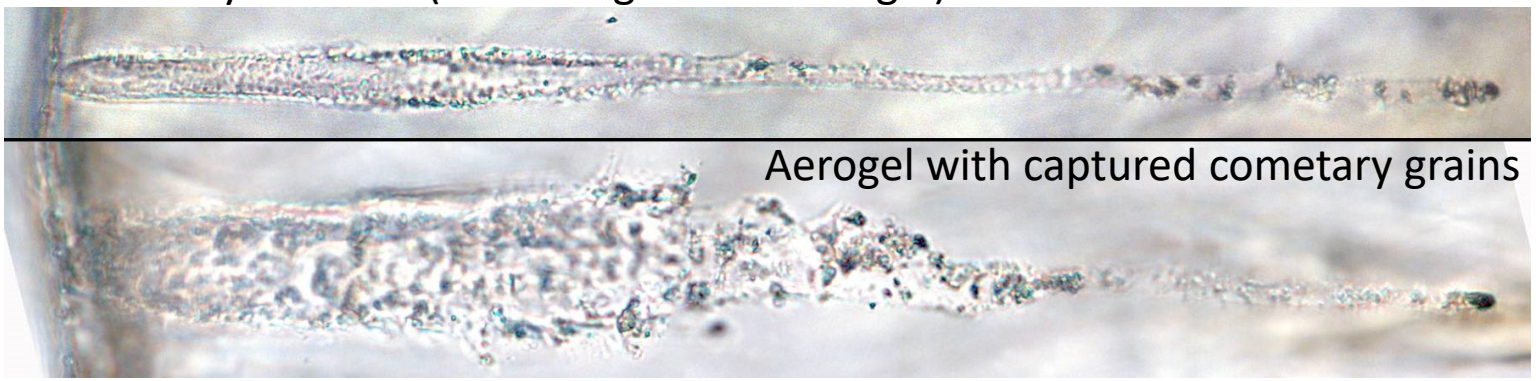
#	Source	(k€)			
		2021	2022	2023	Totale
1	ASI-INAF	108	107	0	215
2	Marie Curie H2020	81	80	10	171
3	iALMA	40	40	40	120

Publications

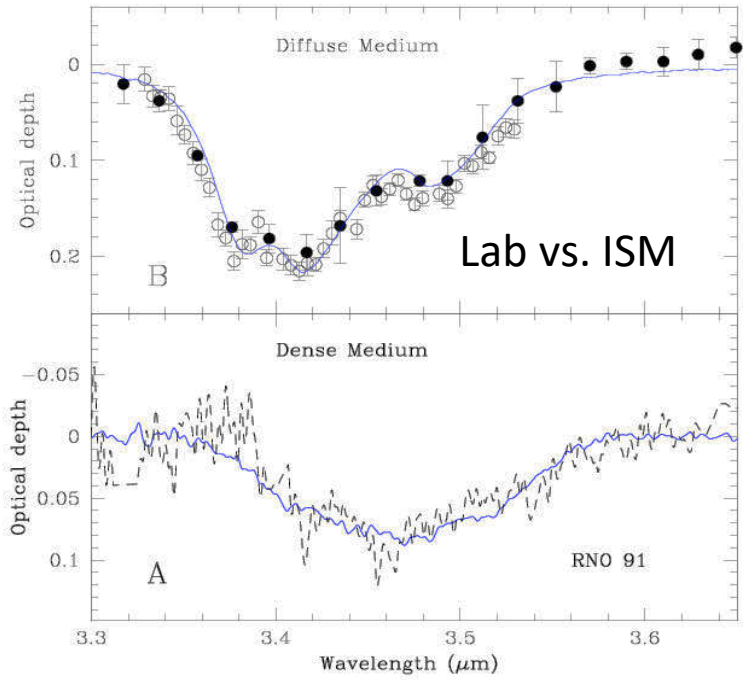
~ 600 article in peer reviewed journals

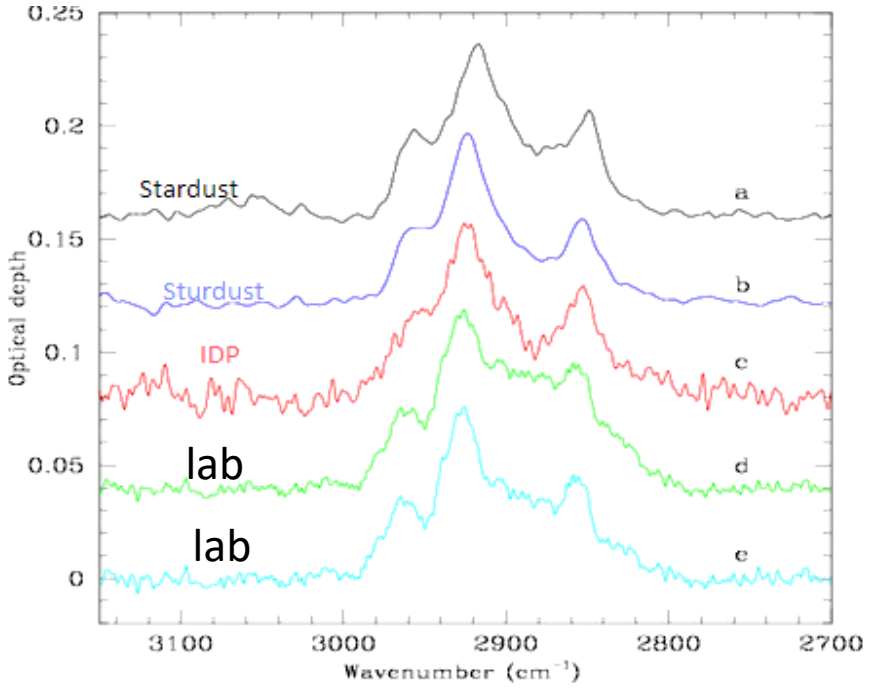
Highlights

1 Analysis of cometary material (Stardust grains in aerogel) and IDPs



2 Evolutionary link between interstellar aliphatic organics and those in the Solar System materials





Organics detected also on 67P/CG by Virtis-Rosetta

Experimental facilities + high scientific impact

Leadership INAF in the field of laboratory astrophysics

Organization of International Conference on Laboratory Astrophysics

Planned activities

Related to Planetary and Satellite surfaces

- Water alteration of rocks and minerals on planets;
- Study of the effects of space weathering on planets and their moon surfaces through the analysis of rock, mineral and ice analogues;
- Simulation of surface cratering by thermal effects produced by high power pulsed laser irradiation of meteorites (chondritic, achondritic, and metallic);
- Terrestrial analogue studies relevant for extraterrestrial transformation and preservation of organic materials in rocks;
- Survival of organic matter on planetary surfaces.

Related to Interstellar environment

- Study of the effects of energetic processing on ice-grain systems relevant for the formation of complex organic molecules in space;
- Studies of the formation of complex organic molecules starting from simple molecules observed in interstellar space.

Criticalities

Required man power: two postdocs to be shared among laboratories to enhance the synergy of the experimental activities

The experimental infrastructure has been built and updated using external funds, which are not stable with time

It is necessary to have a stable financial support by INAF to run the laboratories