

Indian Space Science & Exploration : Global Perspective

Presentation to
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Indian Space Research Organisation

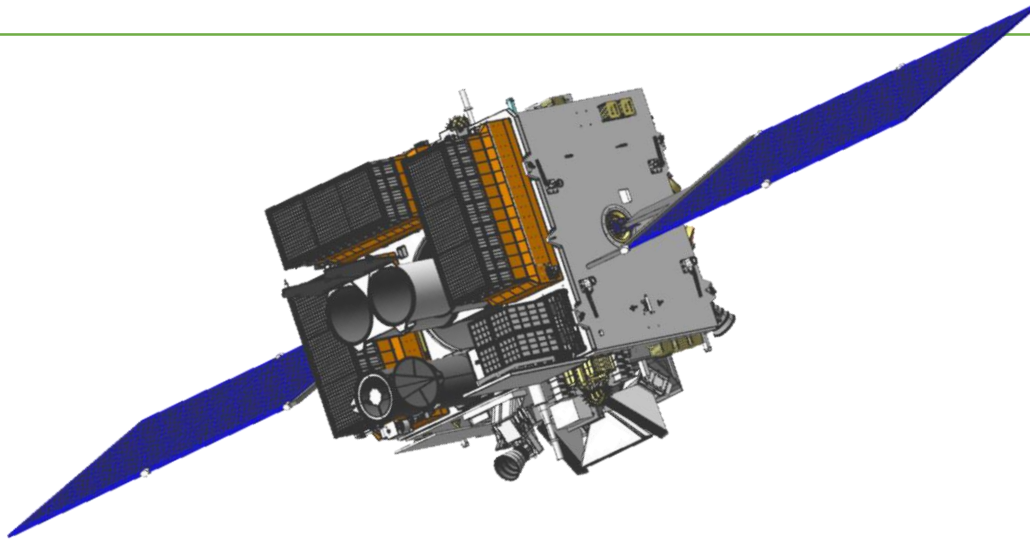
Image Info: Tyrrhenus Mons

50 km

N



Astrosat



- India's first multi-wavelength Astronomy satelliteth
- Launched from Sriharikota on 28th sept 2015
- 650 km circular, low inclination orbit



Astrosat – payloads

Five Scientific payloads

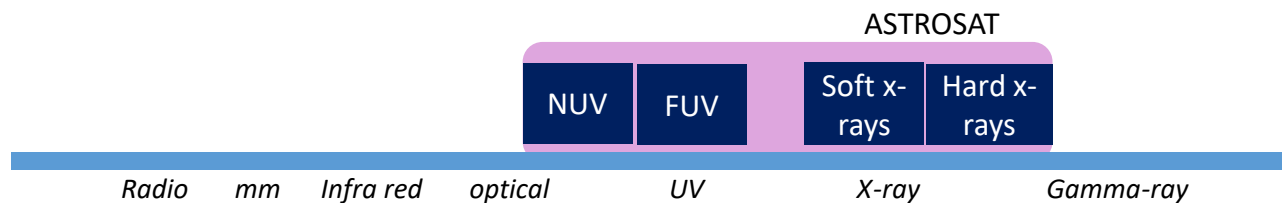
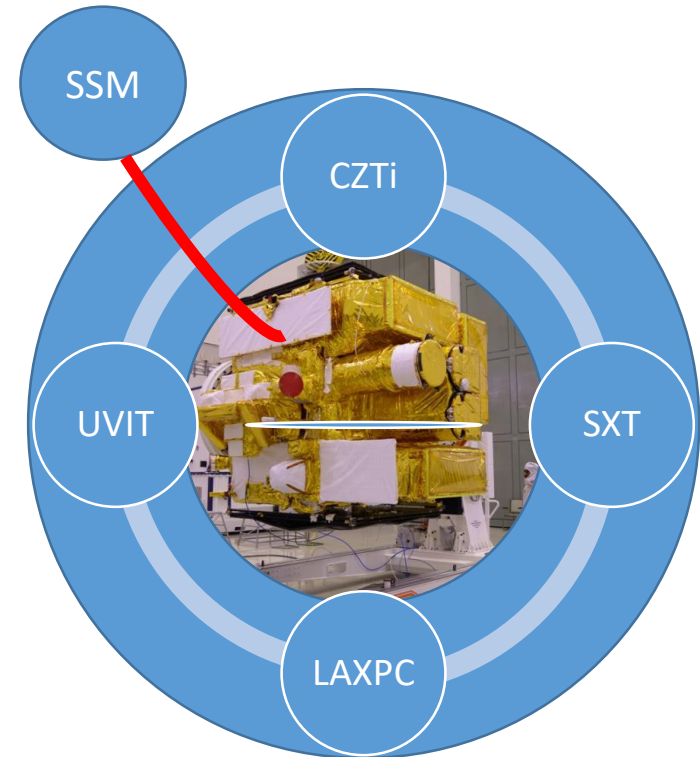
- Ultra Violet Imaging Telescope (**UVIT**)
- Soft X-ray Telescope (**SXT**)
- Large Area X-ray proportional Counter (**LAXPC**)
- Cadmium Zinc Telluride Imager (**CZTi**)
- Scanning Sky Monitor (**SSM**)

✓ imaging

✓ Multi wavelength spectroscopy

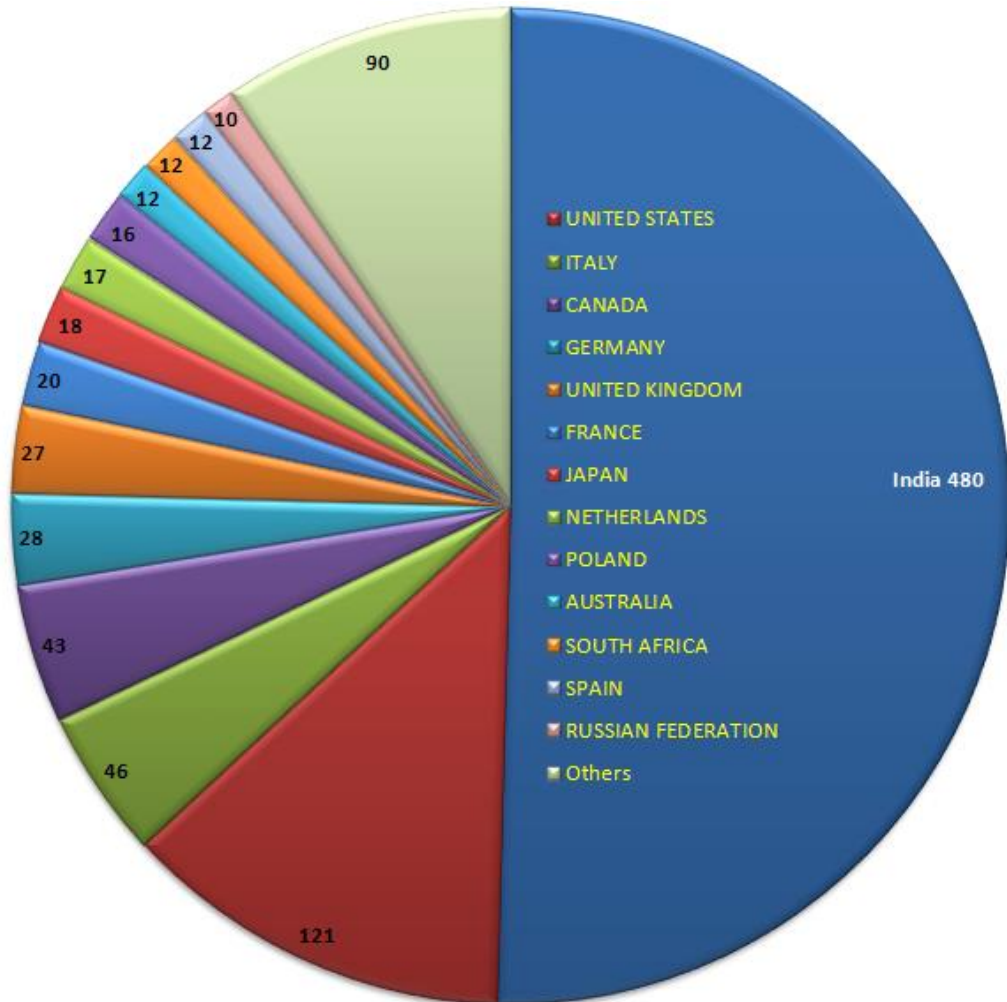
✓ timing

✓ polarimetry



Astrosat – User community

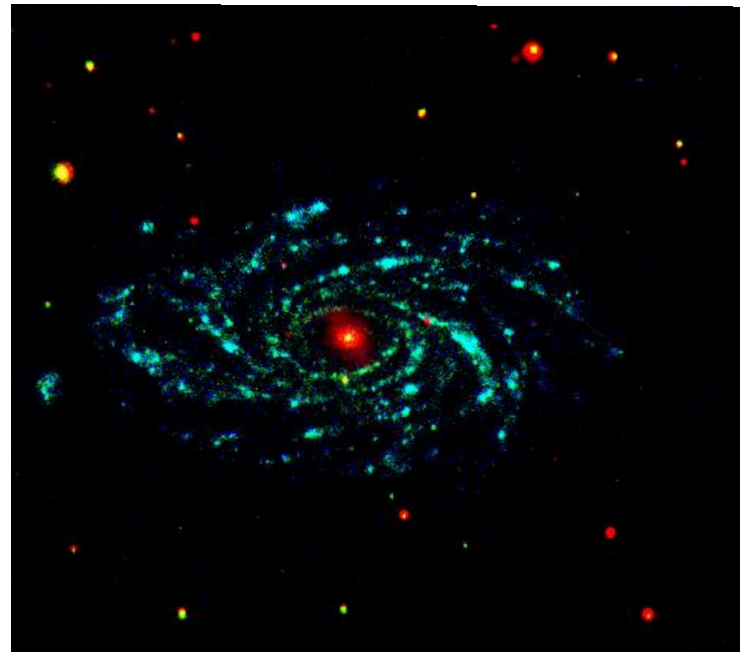
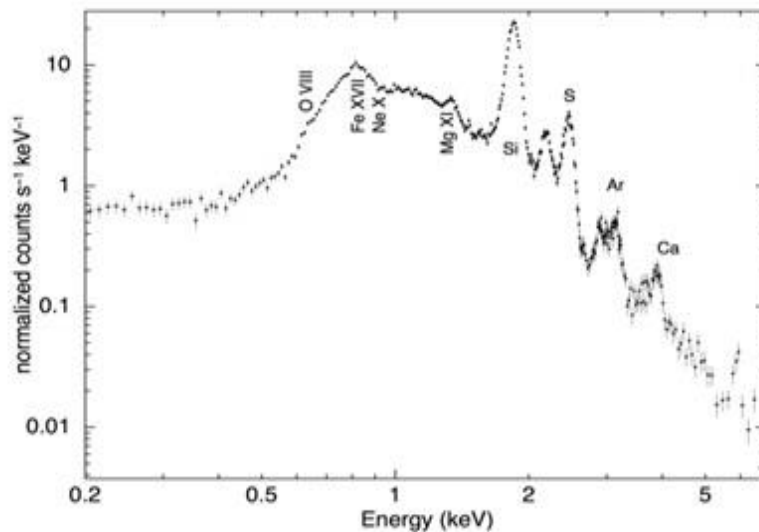
Released 7th call for proposals early-2019 for Oct 2019 to Sept 2020 observations.



Astrosat – Sample results

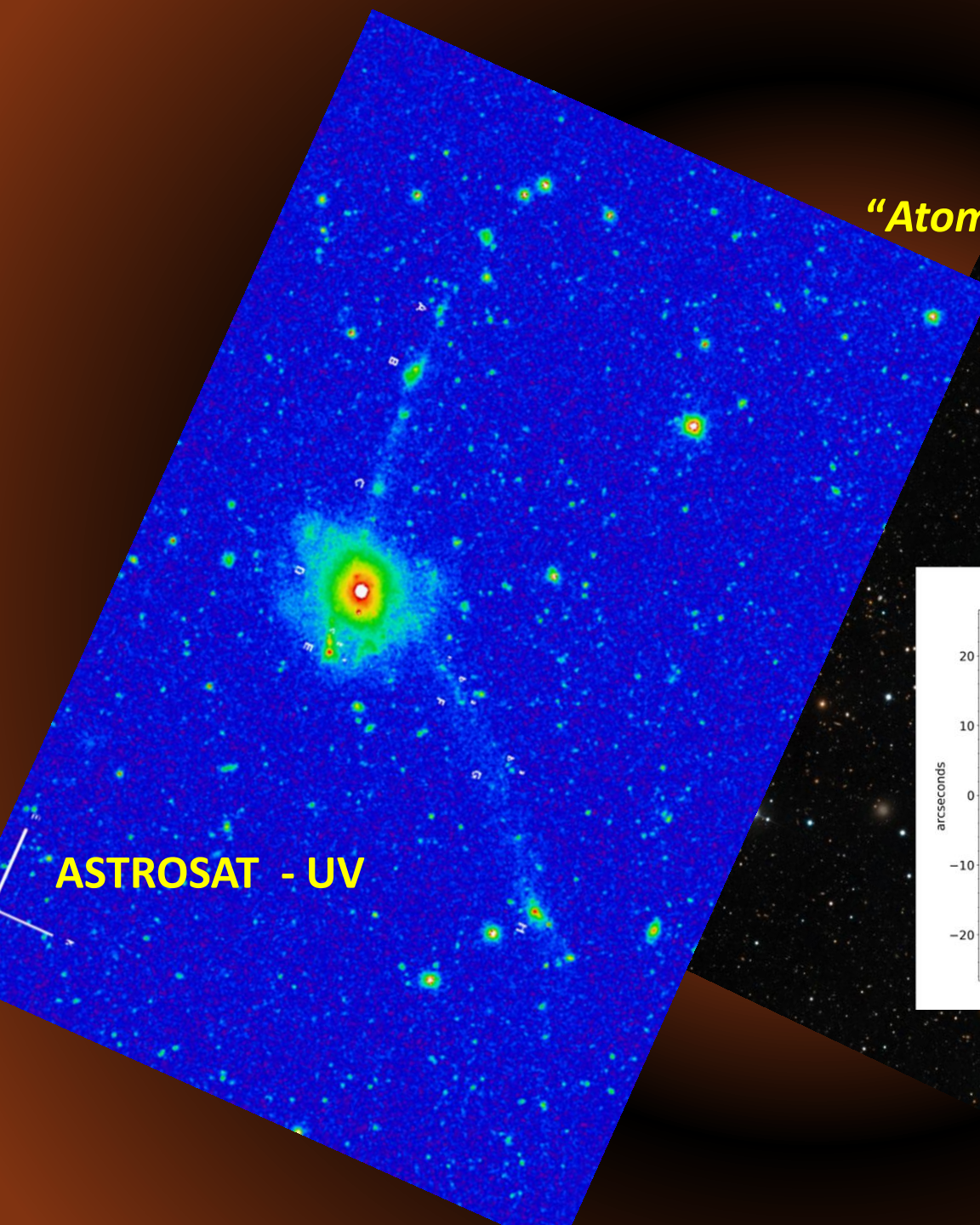
- ~3 times better resolution than GALEX
- Astrometry $1.2' - 1.4'$; Multiple filters

X-ray spectrum of Tycho supernova remnant

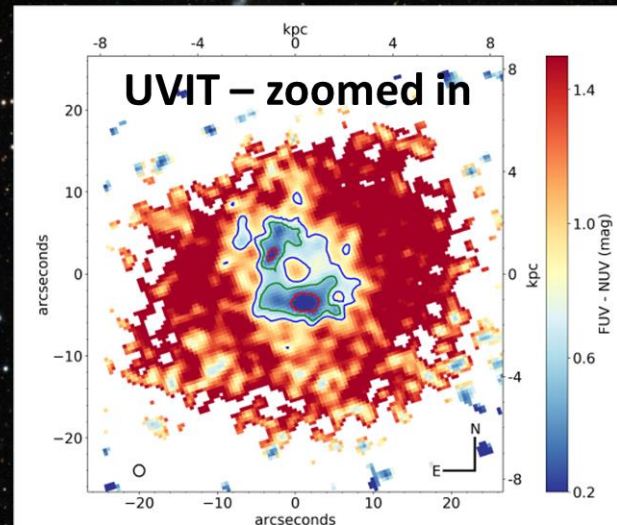


Rahna et al., 2018

“Atoms for Peace” – galaxy NC7252



HST - optical



Aditya L1- Upcoming Indian Solar Mission

- Expected launch- 2020
- Continuous observation of the sun from Earth-Sun Lagrange points L1

Payloads:

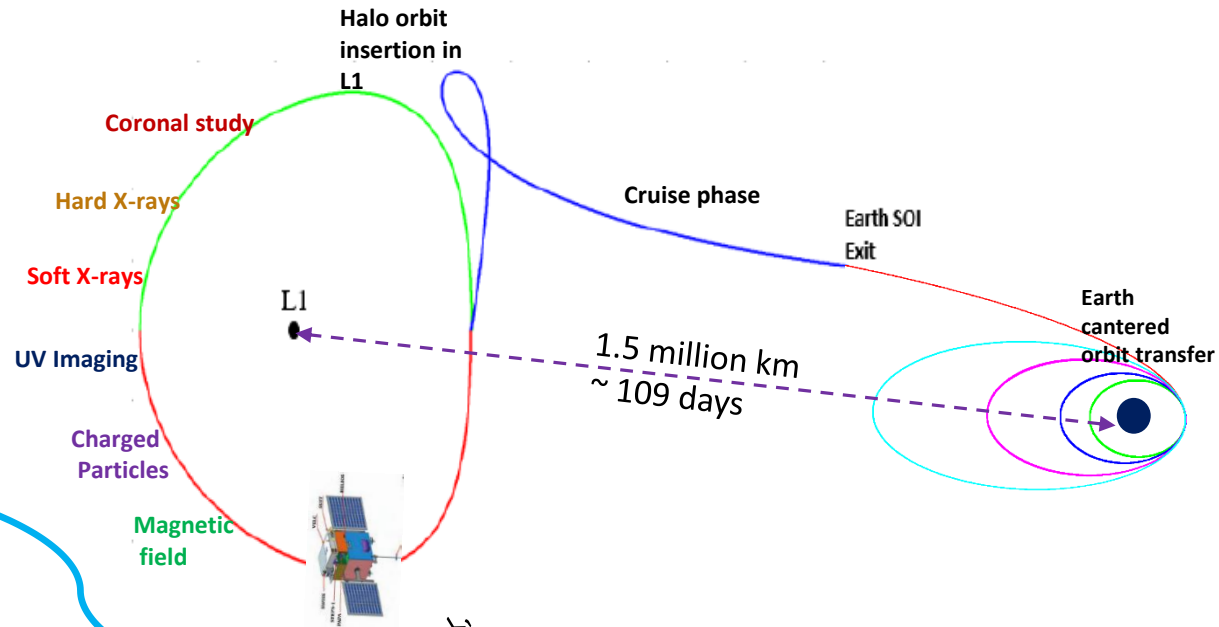
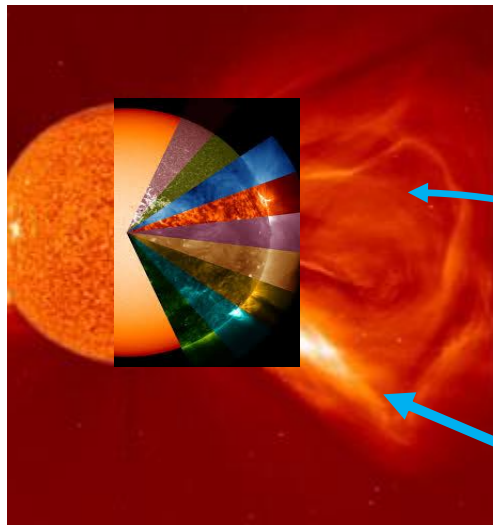
1. **VELC:** Visible Emission line Coronagraph
2. **SUIT:** Solar Ultra Violet Imaging Telescope
3. **HEL1OS:** High Energy L1 Orbiting X-ray Spectrometer
4. **SoLEXS:** Solar Low Energy X-ray Spectrometer
5. **PAPA:** Plasma Analyzer Package for ADITYA
6. **ASPEX:** Aditya Solar wind Particle Experiment
7. **MAGNETOMETER**

Major objectives:

- Understanding the Coronal Heating and Solar Wind Acceleration.
- Understanding initiation of Coronal Mass Ejection, flares and near-earth space weather.
- Coupling and Dynamics of the Solar Atmosphere.
- Solar wind distribution and temperature anisotropy.

In-situ measurements by PAPA, ASPEX and MAGNETOMETER.

Aditya L1- Mission Profile



VELC, SUIT,
SOLEX, HeLIOS

PAPA, ASPEX,
MAG: in situ
measurements

Halo orbital parameters

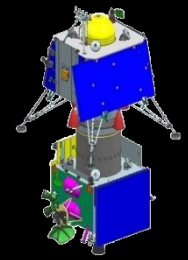
AX : 208951 Km (along Sun-Earth line in Ecliptic plane)

AY : 670024 Km (Perp to Sun-Earth line in Ecl plane)

AZ : 120000 Km (Perp to Ecliptic plane)

Orbital Period : 177.86 days

CHANDRAYAAN-2 MISSION



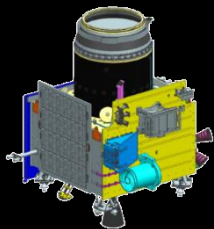
Indian Orbiter, Lander and Rover to study the Moon

Mission Objective:

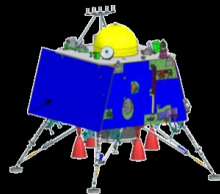
To develop and demonstrate key technologies for end-to-end lunar mission capability, including soft-landing and roving on the lunar surface.

Science Objective:

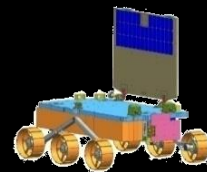
detailed mapping studies of topography, mineralogy and surface chemistry ; regolith thermo-physical characteristics and lunar exosphere.



Orbiter at 100 km orbit
8 Science payloads
1 year mission life



Lander (Vikram) at 70 deg S – unique and unexplored
4 science payloads
~14 Earth days



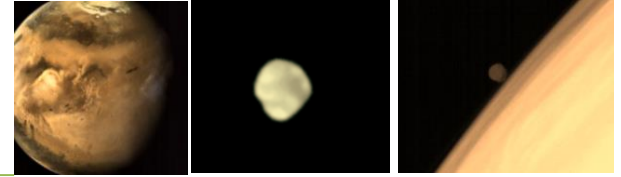
Rover (Pragyan) At vicinity of landing site
2 science payloads
~14 Earth days



All the modules are getting ready for launch on board GSLV-MKIII in July 2019...



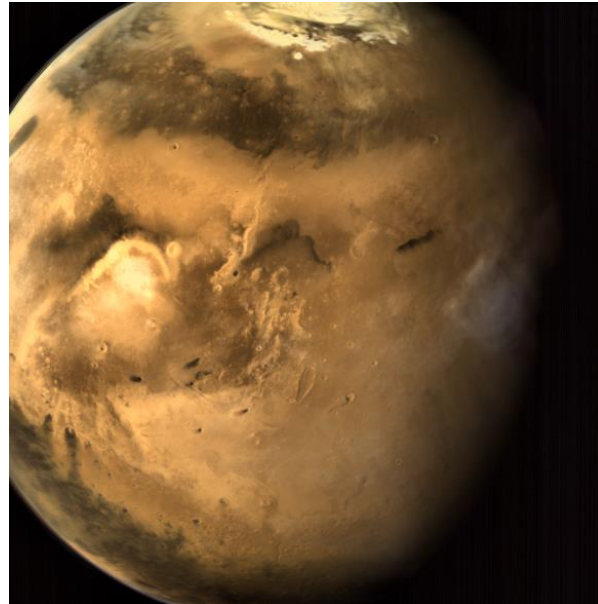
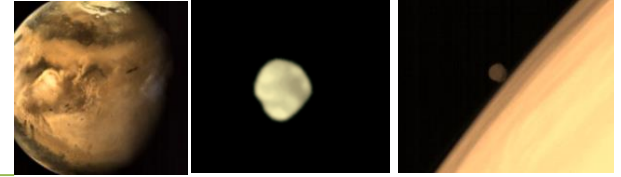
Mars Orbiter Mission (MOM)



- Exploration of Mars surface features, morphology, mineralogy and Martian atmosphere by indigenous scientific instruments
- Completed design mission life of 6 months in Mar, 2015, now on an extended mission.
- Conducted MOM data analysis workshop in collaboration with NASA during Feb 2016.
- Images of the full Martian disc ; far side of Deimos for the first time
- Mars Colour Camera has produced 1000+ images so far.
- Produced Twenty six research publications in peer reviewed journals
- 28 on-going MOM data analysis projects funded by ISRO/DOS
- First three years of scientific data is available through ISSDC website <https://mrbrowse.issdc.gov.in/MOMMLTA/>
- More than 2600 registered users , Total no. of downloads: ~ 23,000, Downloaded more than 690 GB of data

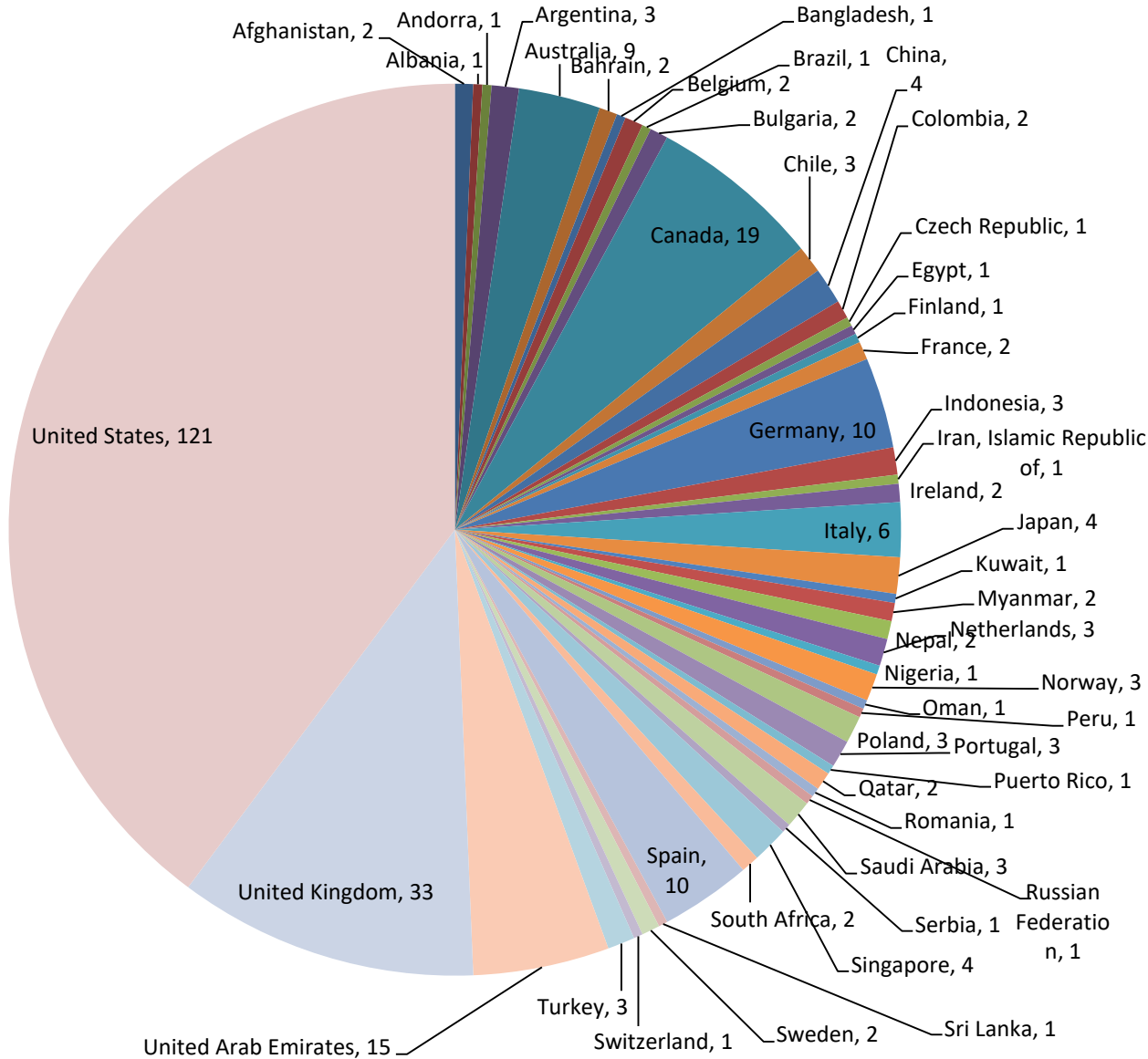
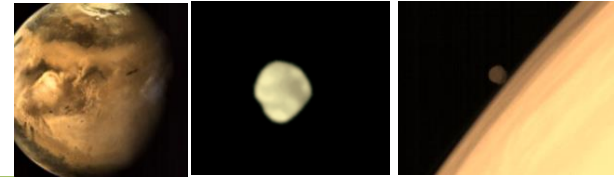


Images taken by Mars Colour Camera on-board MOM





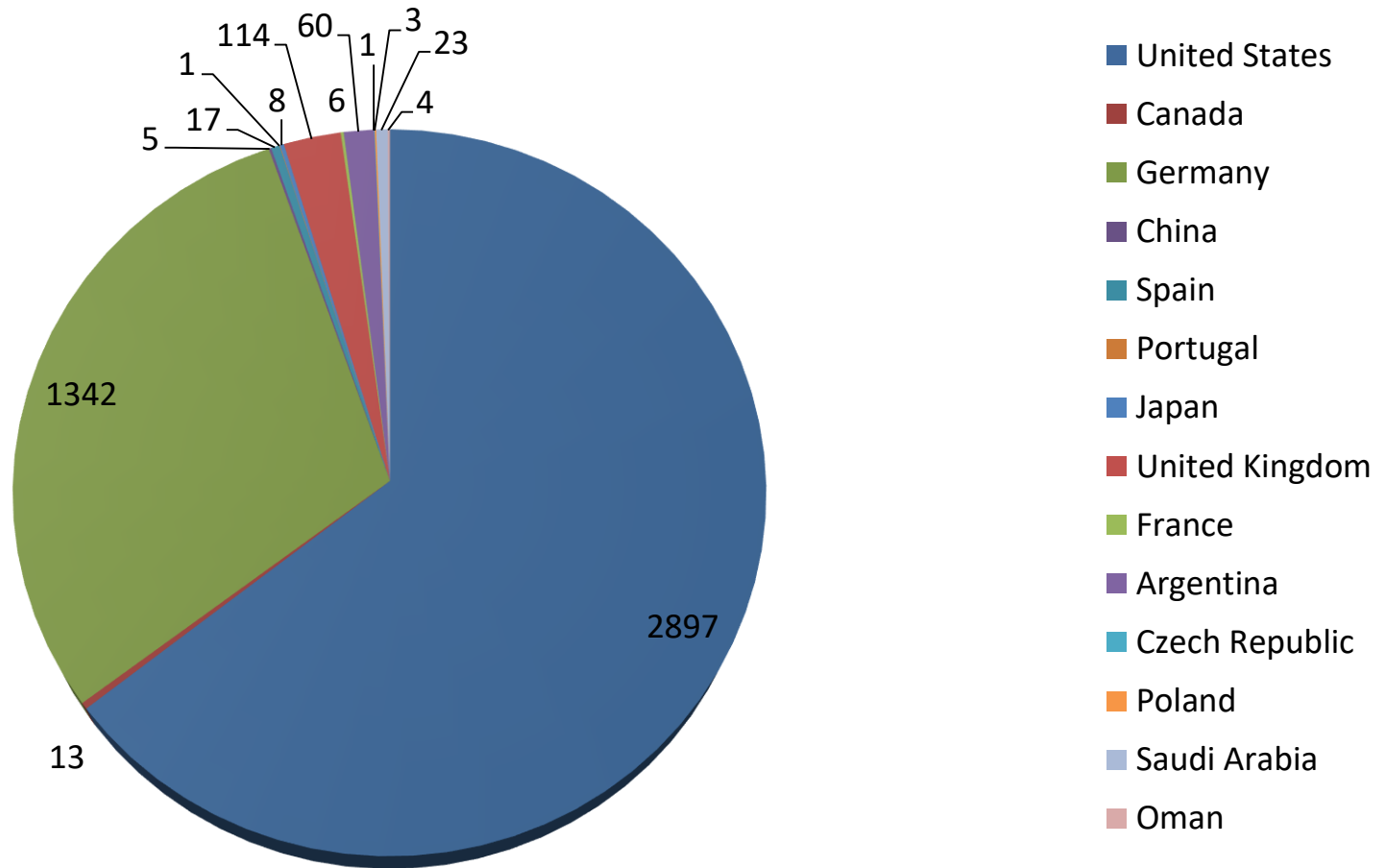
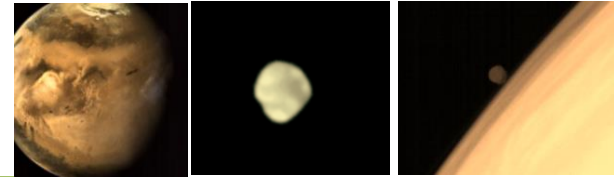
MOM – international users



International registered users from 50 countries



MOM – Data download statistics





Venus Orbiter Mission

Orbiter Mission

- Launch- Mid 2023
- Initial Orbit - 500x60,000 km
- Orbit to be reduced further to lower apoapsis

Science Goals

- Surface/Subsurface studies
- Atmosphere
- Ionosphere
- Sun-Venus Interaction

21 Payload proposals received in response to ISRO's International Announcement of Opportunity



Thank You for your attention