

ISRO –Programmatic Update

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INMWG Meeting on 23Rd Feb 2016

INMWG formation and activities

- Mars Orbit insertion of Mars Atmosphere and Volatile Evolution Mission (MAVEN) (22Sept 2014) of NASA Mars Orbiter Mission (MOM) of ISRO (24 Sept. 2014)
- INMWG formed in Sept 2014
- First face to face meeting at ISRO HQ during 29-31 January 2015.
- Second face to face meeting at US during Aug 2015 and
- Several telecon meetings

INMWG activities (contd.)

- Two subgroups formed to identify –
 - Co-operative science activities
 - Co-operation for Future planetary missions
- Compared MCC-CRISM results
- Co-operation on NGIMS-MENCA results
- Made AO for analysis of MOM data to involve more scientists outside the original teams.
- ISRO-NASA data analysis workshop for Mars data-Feb. 2016
 - To enhance planetary science research

INMWG activities (contd.)

- Identified areas of Science interest
 - Study of the Atmosphere, surface processes and interior of Mars
 - Space weather effects on Martian environment; Understanding the aqueous evolution of Mars
 - Past Climate
- Proposed areas of co-operation
 - Potential co-ordinated observations of the ongoing Mars missions
 - Results/ Data exchange from specific instruments and for specific events / phenomena to enhance science returns

Updates on Mars missions

- From MOM
 - Publications : 6
 - Meeting/conference proceedings: 10+
 - Future planetary missions
 - Likely -- mission to Mars and Venus; studies under progress;

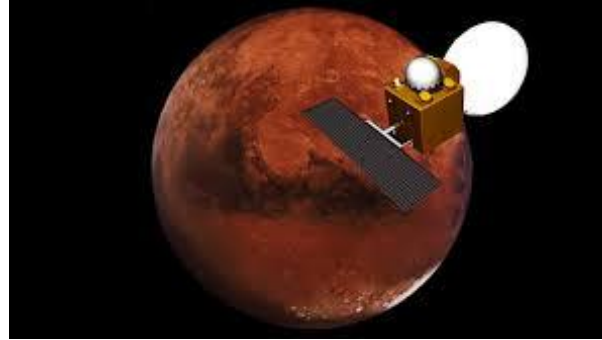
MOM - List of Publications

Journal publications

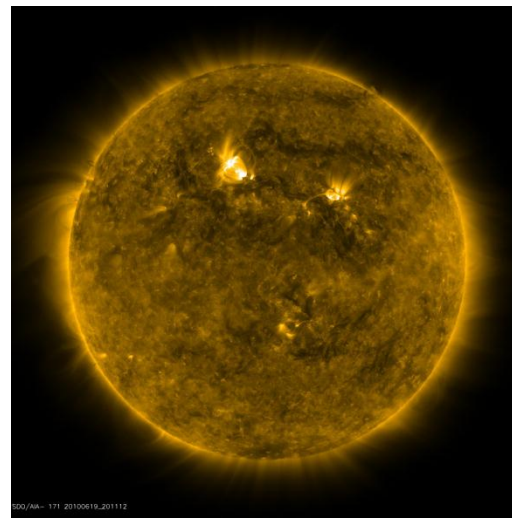
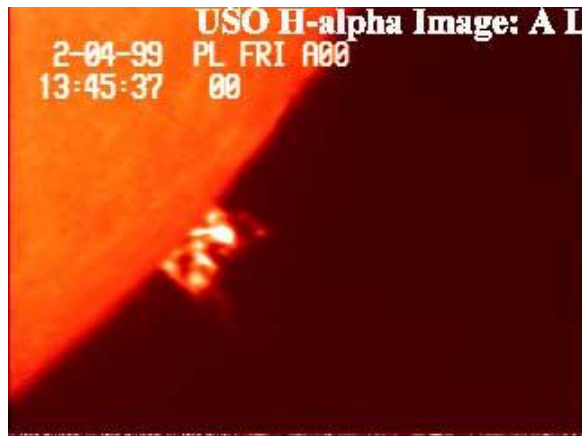
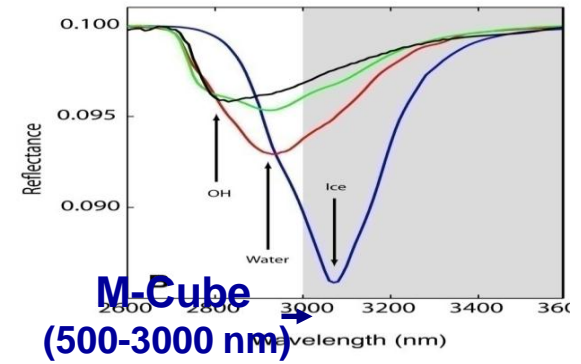
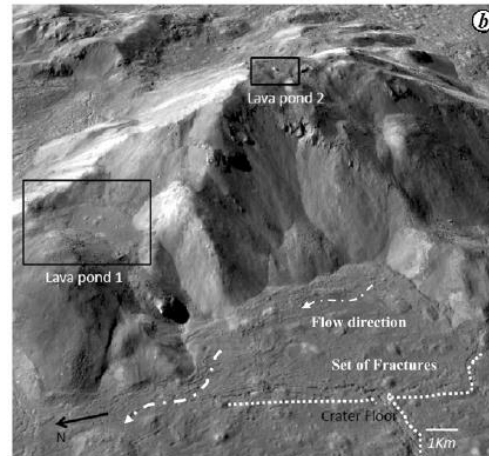
- [1] A. S. Arya, et.al, ***Mars Colour Camera: the payload characterization/calibration and data analysis from Earth imaging phase***, Curr.Sci, 109 (2015)1076.
- [2] A.S. Arya et.al, ***Indian Mars-Color-Camera Captures Far-Side of Deimos : A Rarity Among Contemporary Mars Orbiters***, Planetary and Space Science, 117 (2015) 470.
- [3] Arya, A.S and Kiran kumar, A.S., ***Mars Orbiter Mission prepared to photograph Mars: some results from Earth Imaging Experiment***. Curr.Sci., 106 (2014), 661.
- [4] Kiran Kumar, A.S., Chauhan, P., ***Scientific exploration of Mars by first Indian interplanetary space probe: Mars Orbiter Mission***, Curr.Sci, 107 (2014), 1096.
- [5] Manoj K. Mishra et.al, ***Estimation of dust variability and scale height of atmospheric optical depth (AOD) in the Valles Marineris on Mars by Indian Mars Orbiter Mission (MOM) data***, Icarus, 265 (2016) 84.
- [6] A.S. Arya, et.al, 2015, ***Surface, Atmosphere and Moons of Mars: Initial results from Mars Color Camera (MCC)*** , (Under Review CS)
- [7] Anil Bhardwaj, et.al, 2016, ***On the evening time exosphere of Mars: Result from MENCA aboard Mars Orbiter Mission***, Accepted for publication in GRL.

Current Science (Vol. 109, No: 6, 25 Sep 2015) Special section on MOM

On-going cooperation in Mars Missions



Lunar exploration



Heliophysics Prospective Co-operation

Other activities with NASA

- Indo-US Civil JWG meeting held during 23-24 Sept, 2015
- Cross Support meeting held on 22nd Jan 2016

Co-operation in lunar missions

- Payloads in Chandrayaan-1
 - Five Indian payloads
 - M3: Moon Mineralogy Mapper
 - Mini-SAR: Miniature Synthetic Aperture Radar
- Data analysis still continuing
- Data now made public through ISSDC and NASA sites
- Ch-1 data and LRO data when requested for specific areas
- AO for proposals for data analysis of Ch-1 data

Chandrayaan-2 Payloads

Orbiter

Terrain Mapping Camera - prepare a 3D map of the lunar surface

IR spectrometer- identify minerals and signatures of OH and H₂O molecules

Synthetic Aperture Radar- understand the surface and sub-surface features especially the polar regions

Neutral Mass Spectrometer- study the lunar exosphere and

Soft X-ray spectrometer along with the solar X-ray monitor for studying the chemical composition.

Lander

Seismometer to measure the seismicity around the landing site

Thermal probe- estimate the thermal properties of lunar surface
Langmuir probe- measure the surface plasma density and its variation
Radio occultation experiment- measure the total electron content

Rover payloads will study the elemental composition of the lunar surface near the landing site.

Proposed cooperation in Heliophysics and Space Weather

Activities proposed

In view of the upcoming missions of ISRO and NASA

- Modeling of solar activity
- Joint observations and data analysis using existing or future missions
- Ground-based observations
- Mission data download
- Payload opportunities on satellites of ISRO and NASA
- Space weather
- Participation in International Living With a Star (ILWS)

Cross support meeting

- Meeting held on 22nd Jan 2016
 - Badri Younes
 - Naseem Saiyed
 - Pete Vrotsos
 - Greg Mann
 - Sami Asmar
- Placing RF relay payload on future Mars missions
- Requested for details like mass, power, volume etc.

Potential areas of Co-operation

- Information of programmatic plans on future missions/programs
- Update of opportunities available between ISRO and NASA- payloads, scientific data
- Cross-calibration of ASTROSAT payloads with X-ray missions of NASA through IACHEC
- Discussion on observations, joint data analysis and results;
- Cross- support using ground stations for missions flown by ISRO/NASA

Points of discussion for further Co-operation

- Any opportunities of joint payload development
- Discussion on observations, data analysis;
- Potential co-ordinated observations of the ongoing Mars missions joint data analysis and results;
- Cross- support using ground stations for missions flown by ISRO/NASA

Thanks