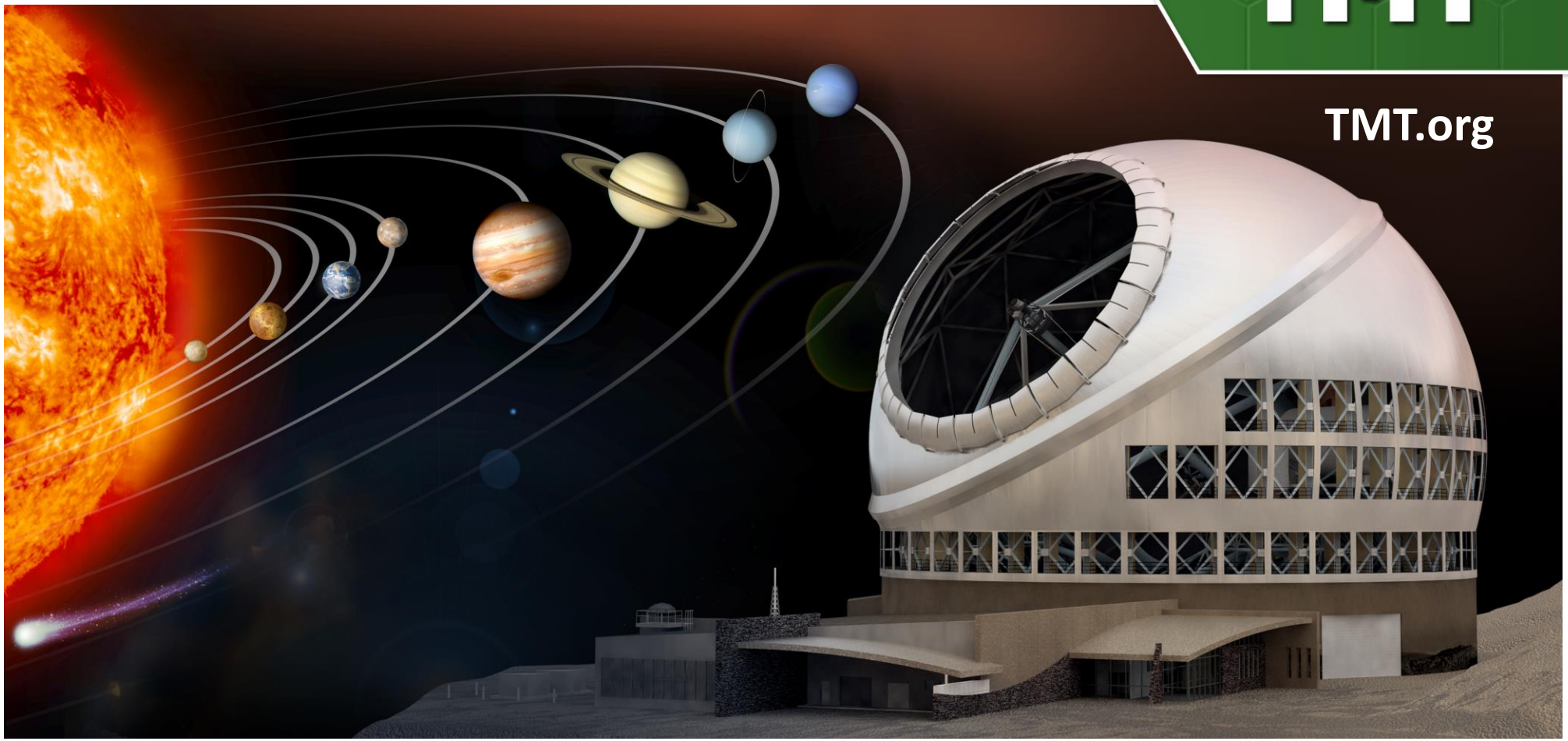
Studying our Solar System with the Thirty Meter Telescope

TMT



TMT.org

30 m 望遠鏡
三十米望远镜
तीस मीटर दूरबीन
Thirty Meter Telescope
Télescope de Trente Mètres

Caltech INDIA TMT NAOC 国立天文台 NAOJ National Astronomical Observatory of Japan NRC·CNRC Canada THE UNIVERSITY OF CALIFORNIA 1868

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Solar System Science with TMT

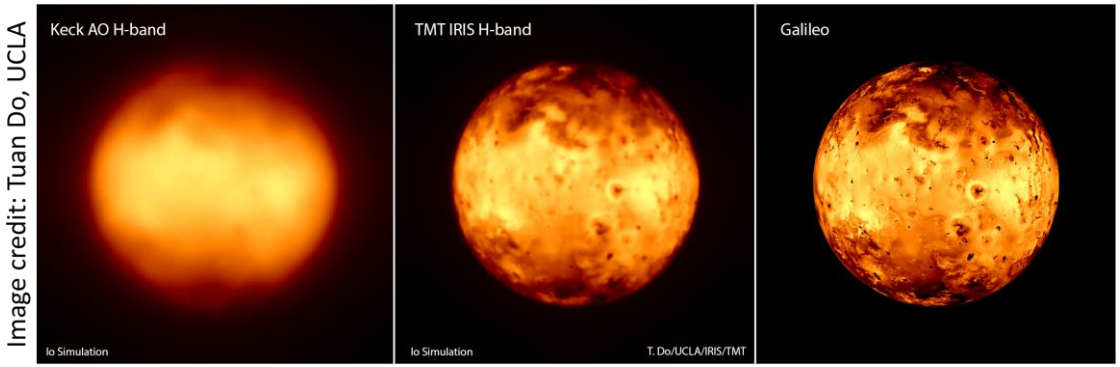
With its 30m diameter primary mirror and adaptive optics equipped science instruments, TMT will push the limits of exploration of our Solar System, providing the sharpest eye ever for observing the broad diversity of its population.

Forefront solar system science enabled by TMT's advanced vision includes:

- Studies of the physical and chemical properties of planetary atmospheres and planetary satellites, ring systems, (cryo–) volcanoes, and the small bodies population (asteroids, comets, Centaurs & trans-Neptunian objects)
- Processes for delivering volatiles to the inner planets
- Mechanisms involved in the formation and evolution of our Solar System
- The search for primordial organic compounds outside Earth
- …and much more!

TMT spatial resolution at 1µm and at opposition for selected solar system bodies

Target	Diameter (km)	Distance (in AU)	Angular diam. (")	Nb resolution elements across apparent diam.	Nb resolution elements across apparent surf.	Spatial resolution (km)
Ceres	952	1.63	0.81	130	17012	7
Pallas	545	1.29	0.58	94	8920	6
Io	3644	4.09	1.23	199	39442	18
Europa	3122	4.09	1.05	170	28951	18
Titan	5152	8.09	0.88	142	20156	36
Triton	2706	28.87	0.13	21	436	130
Chiron	220	15.96	0.02	3	9	72
Pluto	2390	34.05	0.10	16	245	153
Charon	1210	34.05	0.05	8	63	153
Mars	6780	0.64	14.55	2352	5531644	3
Jupiter	143000	4.09	48.23	7794	60740203	18
Saturn	120500	8.09	20.55	3321	11026150	36
Uranus	51120	18.24	3.86	624	389997	82
Neptune	49530	28.87	2.37	382	146085	130



Comparison of simulated H-band adaptive-optics (AO) corrected images of Io (raw-image equivalent, no deconvolution applied) for the 10m-Keck (left) and 30m-TMT (center). The original image (right) was obtained in September of 1996 by the Galileo spacecraft while it was at a distance of ~500,000km from Jupiter's satellite. The exposure time for the TMT (IRIS instrument + AO) simulated image (4 milli-arcsecond/pixel) is equivalent to 1 second. The finest spatial details in the TMT image are about 30km in size, to be compared to 10km for Galileo's.

Overview of First-Light Instruments Capabilities

- **IRIS:** AO-fed near-IR (0.8-2.4 µm) imager (4mas pixels) + integral-field spectrograph (spatial resolution 4-50mas, spectral resolution 4,000-10,000)
- **WFOS:** Seeing limited multi-object wide-field optical (0.3-1.1 µm) imager (40 arcmin² FoV) + spectrograph (spectral resolution: 1000 to 8000), up to 200 objects at once
- **IRMS:** AO-fed near-IR (0.9-2.5 µm) imager (2.3 arcmin² FoV) and multi-object spectrograph (spectral resolution ~4,000), up to 46 slits