Potential Lunar Subsolar Hydration Feature

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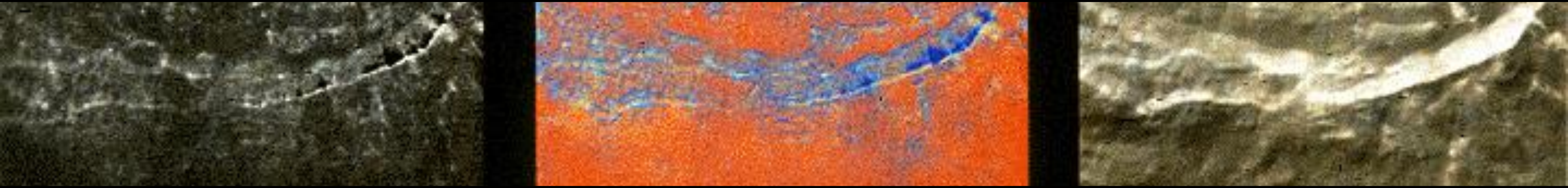
Why the Moon's Mineralogy is Important



Scientific Insight into Processes

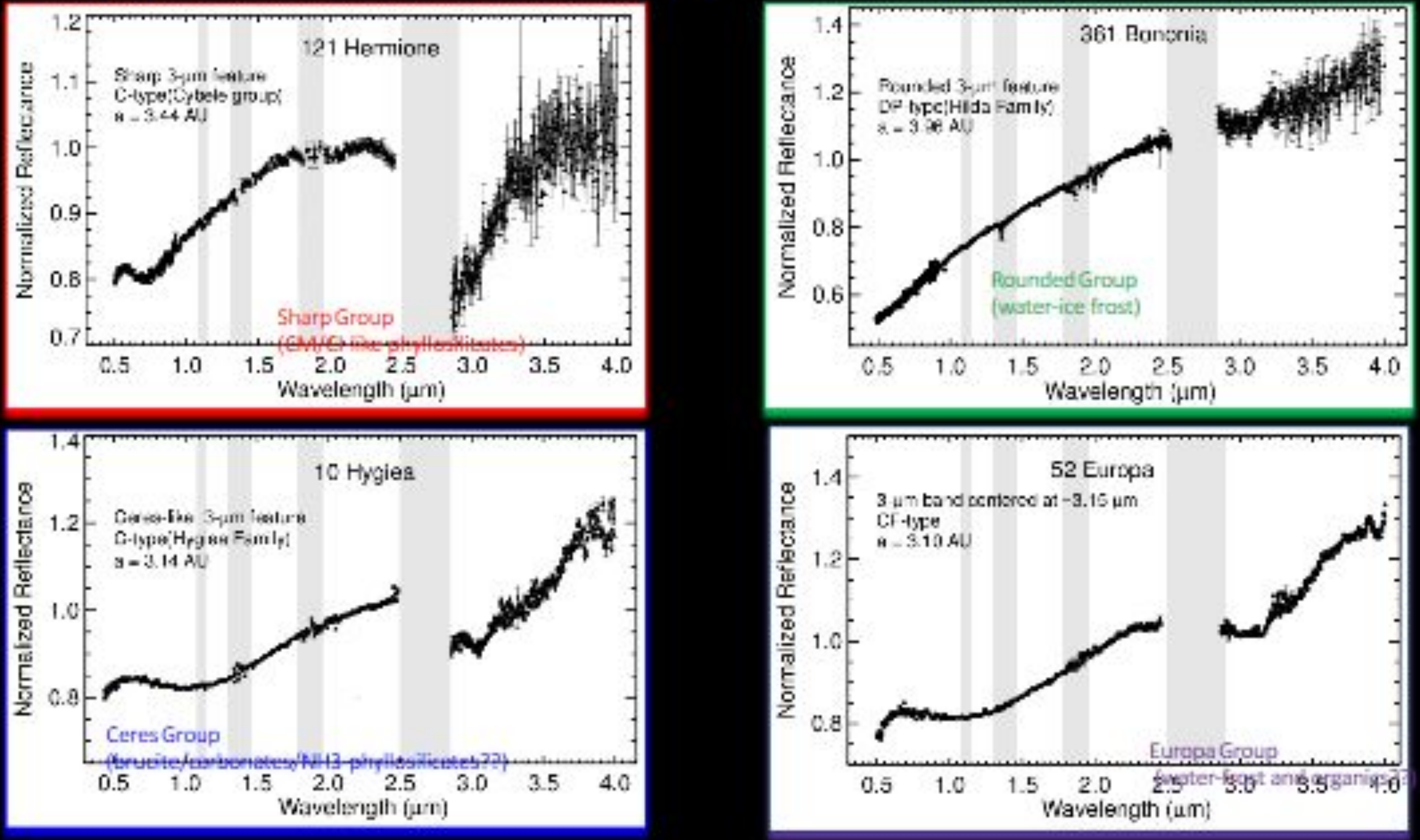
Future Exploration

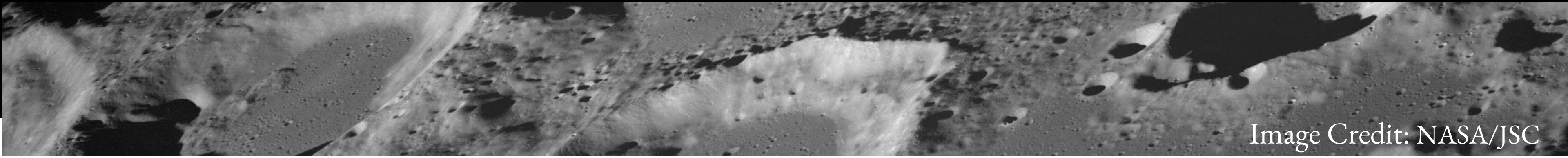
Assessment of Dynamic Process of the Moon and its Environment

In Situ Resource Utilization for Human Exploration

Previously, the Moon has been considered anhydrous.

Spectra with Different 3 um Features





Cassini

Year: 1999

Findings: Hydration Found At the Poles and Highlands of the Moon

Deep Impact

Year: 2007 & 2009

Findings: Entire Lunar Surface Hydrated During Some Portions of the Day

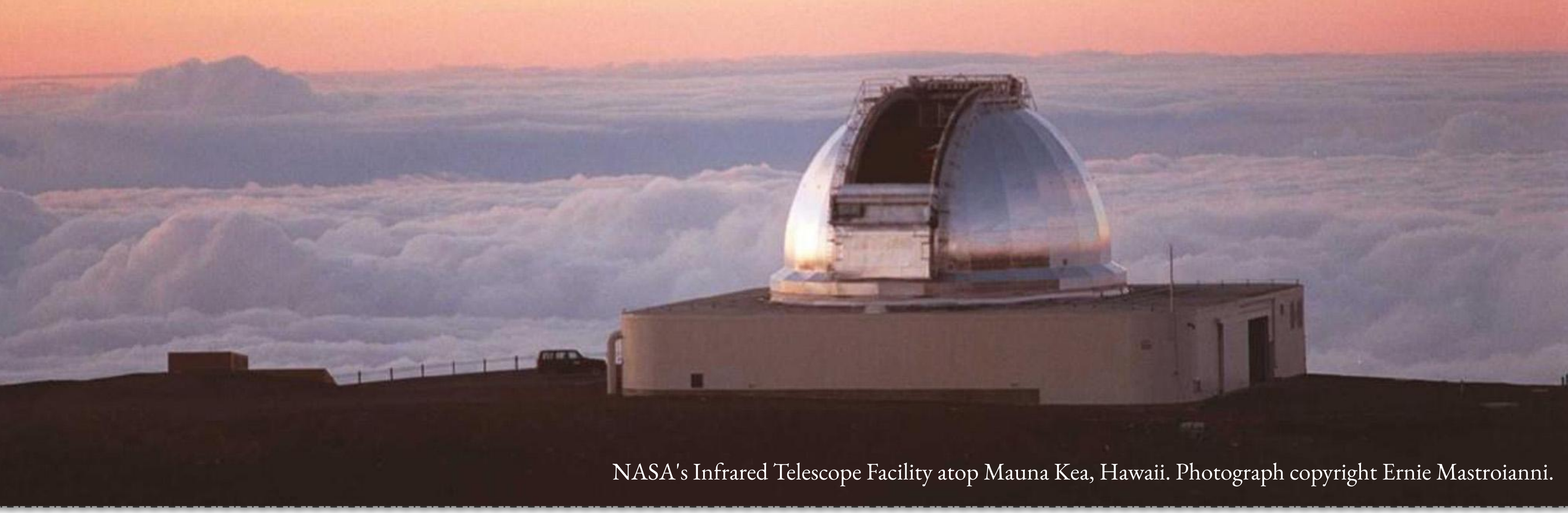
Moon Mineralogy Mapper on Chandraayan-1

Year: 2009

Findings: Water Molecules on the Poles of the Moon

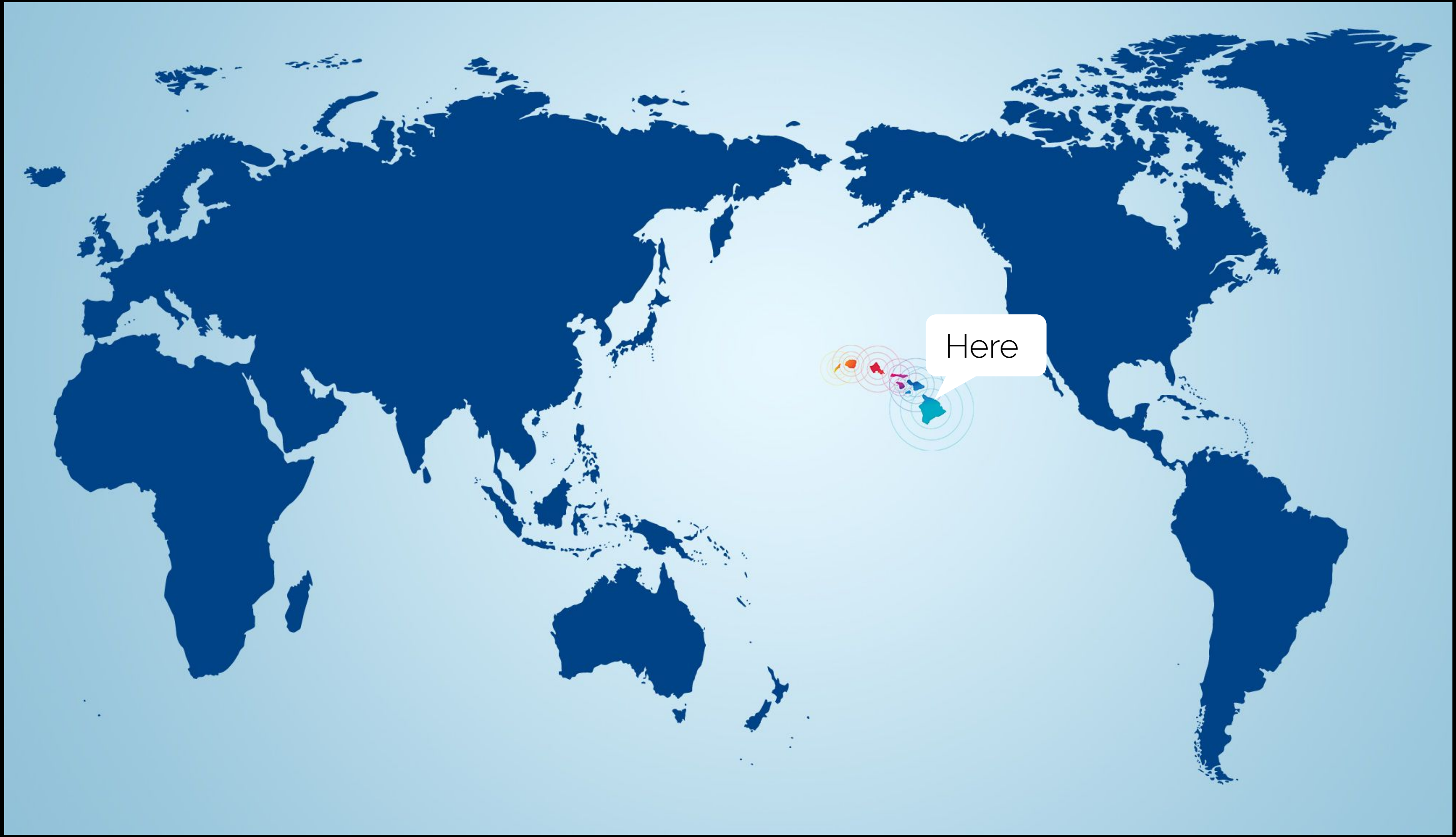
When and Where Do We Find Hydration

If any...



NASA's Infrared Telescope Facility atop Mauna Kea, Hawaii. Photograph copyright Ernie Mastroianni.

Observations and Data Collection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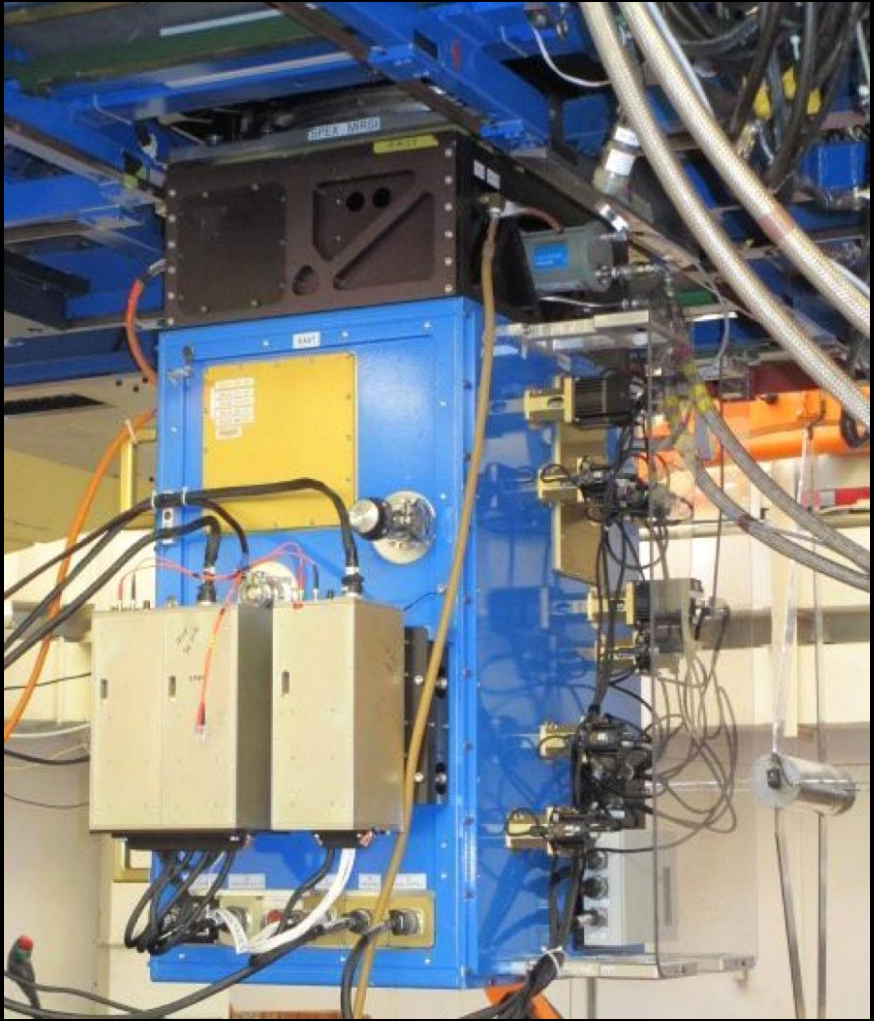
Instrument: SpeX

- LXD_short
- Resolution ~ 2500
- 1.67-4.2 um
- 0.3x15'' slit



NEATM: Near Earth Asteroid Thermal Model

- The basis of the STM is the assumption of instantaneous equilibrium between insolation and thermal emission and a simple temperature distribution on a smooth spherical (Lebofsky et al.)
- The near-Earth asteroid thermal model (NEATM) (Harris and Lagerros) is an improved version of STM that takes into account the surface roughness and thermal inertia
- the sub-solar temperature of the Moon is calculated by assuming equilibrium between solar insolation and emitted thermal flux. The temperature across the disk is then assumed to vary as [cos(i)]^.25.
- The Planck function is then integrated over the visible surface of the disk to get the emitted intensity, which is multiplied by the solid

angle to get the flux as seen at the earth.

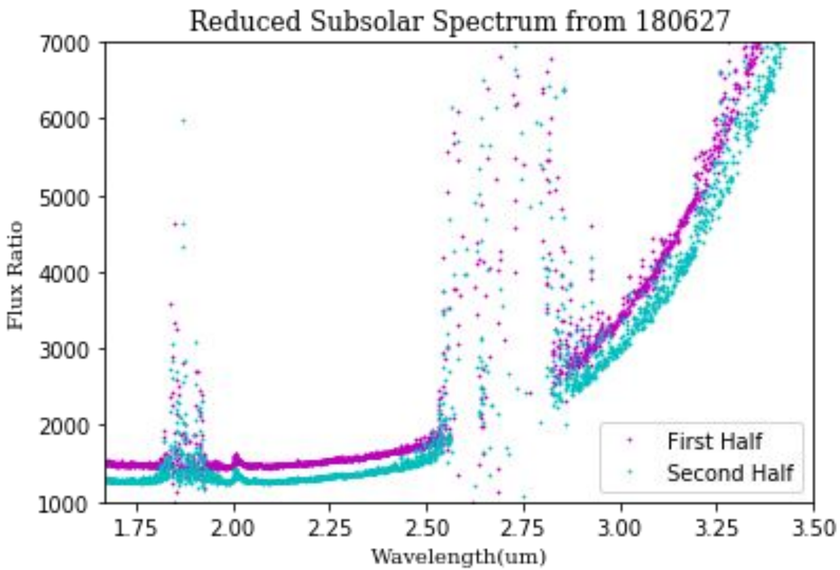
$$S_{abs} = \pi \frac{D^2}{4} S(1 - A)$$

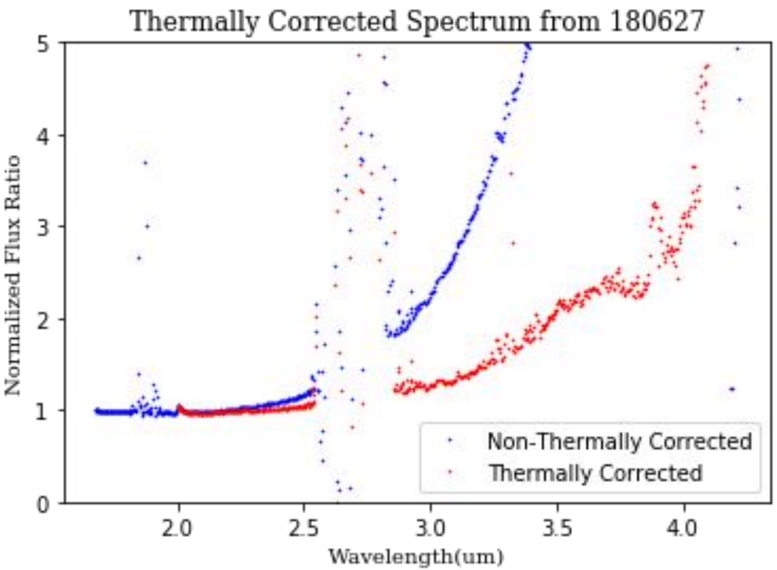
$$A = A_v = q\, p_v$$

$$T(\varphi) = T(0) \cos^{1/4} \varphi$$

$$T(0) = [(1 - A)S/(\eta\, \varepsilon\, \sigma)]^{1/4}$$

Best Results from Three Nights of Data





In Summary

- Absorption Feature Detected Using NEATM
- Consistent with Hydration Feature at Lunar Noon

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Acknowledgements

Dr. Heather Kaluna-University of Hawaii at Hilo
Dr. Driss Takir- NASA Johnson Space Center
Dr. Casey Honiball-University of Hawaii at Manoa

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