SCIENTIFIC BREAKTHROUGHS FROM THE MOON MINERALOGY MAPPER. C. M. Pieters[1] and the Moon Mineralogy Mapper Team, [1]Department of Geological Sciences, Brown University, Providence, RI 02912 (Carle_Pieters@brown.edu).

Introduction: The Moon Mineralogy Mapper (M^3) is a state-of-the-art visible and near-infrared imaging spectrometer that was a guest instrument on Chandrayaan-1, the Indian Space Research Organization's (ISRO) first mission to the Moon. The instrument was designed to measure the diagnostic mineral absorption bands of solar radiation reflected from the lunar surface with a spatial resolution and coverage to provide geologic context. During operations, M^3 demonstrated excellent instrument uniformity and performance. Although the mission lasted for only10 months, global coverage was achieved in the M^3 low-resolution mode. Unfortunately, the spacecraft thermal environment exceeded requirements, forsing mission operations to be intermittent and under highly variable conditions. The last three months of operation were without star-trackers and from a higher altitude (200km vs 100km). Nevertheless, M^3 was the first imaging spectrometer to orbit the Moon and collect detailed near-infrared spectroscopic data (500 – 3000 nm) for mineral assessment. Highlighted below are examples of the valuable breakthroughs provided by M3 on Chandrayaan-1.

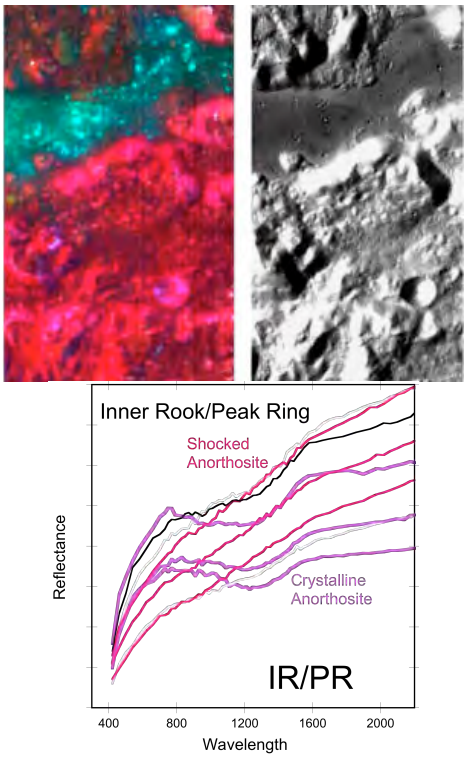

Figure1. **Massive and extensive anorthosite** is identified (in crystalline and shocked anorthosite form) as comprising the Inner Rook Mountains. This exposure is extraordinary strong evidence for the Magma Ocean hypothesis of lunar crust formation. [e.g. Pieters et al 2009, lpsc]

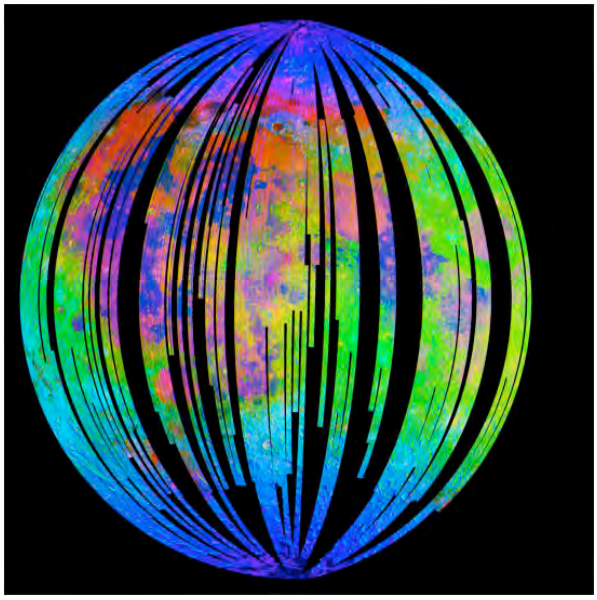

Figure 2. **Surficial OH/H2O** is found to be widespread across the Moon (most readily detected in cooler environments near the poles or terminator). [Pieters et al 2009, Science; Clark 2011, lunar volatiles workshop]

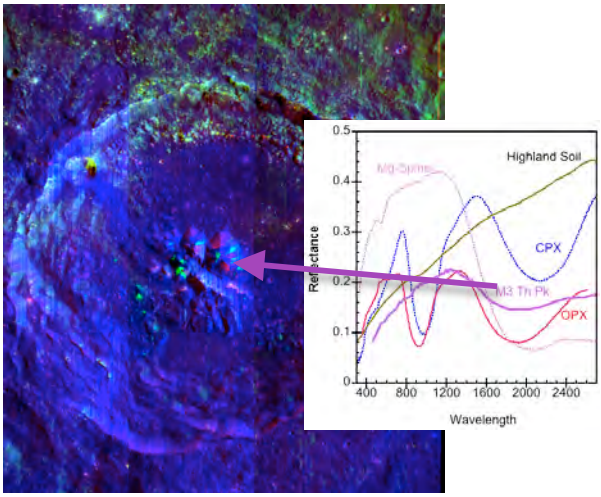

Figure 3. **New Mg-spinel Rock Type** discovered in farside feldspathic Moscoviense Basin and at Theophilius central peaks (shown here) [Pieters et al 2011 JGR; Dhingra et al 2011 GRL] This discovery and its deep-seated origin indicates this new rock type is an important part of lunar crustal stratigraphy.

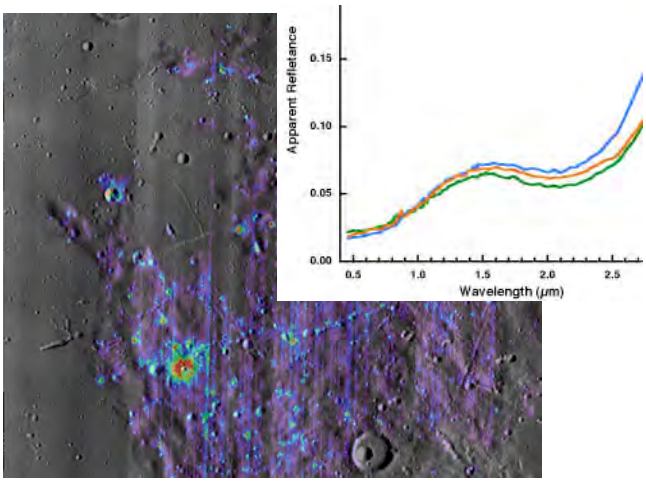

Figure 4. ***New*** **Pyroclastic** ***Mineralogy*** found at regional nearside Dark Mantle Deposits: Cr-spinel dominates the optical properties of Sinus Aestuum DMD. [see Sunshine et al., 2010, lpsc]

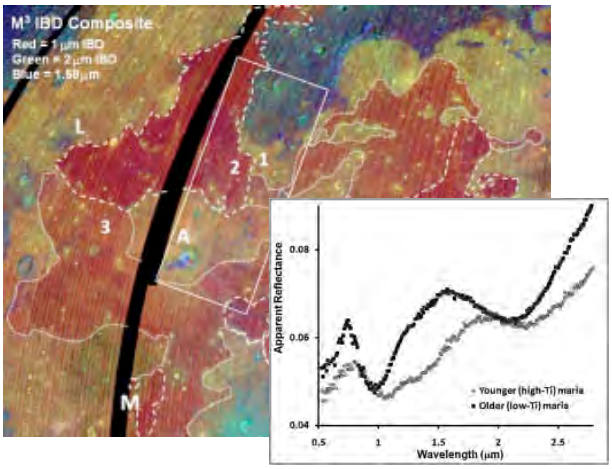

Figure 5. **Young** ***picritic*** **basalts**. The western Ti-rich basalts (red in this composite) contain abundant olivine. [see Staid et al., JGR 2011]

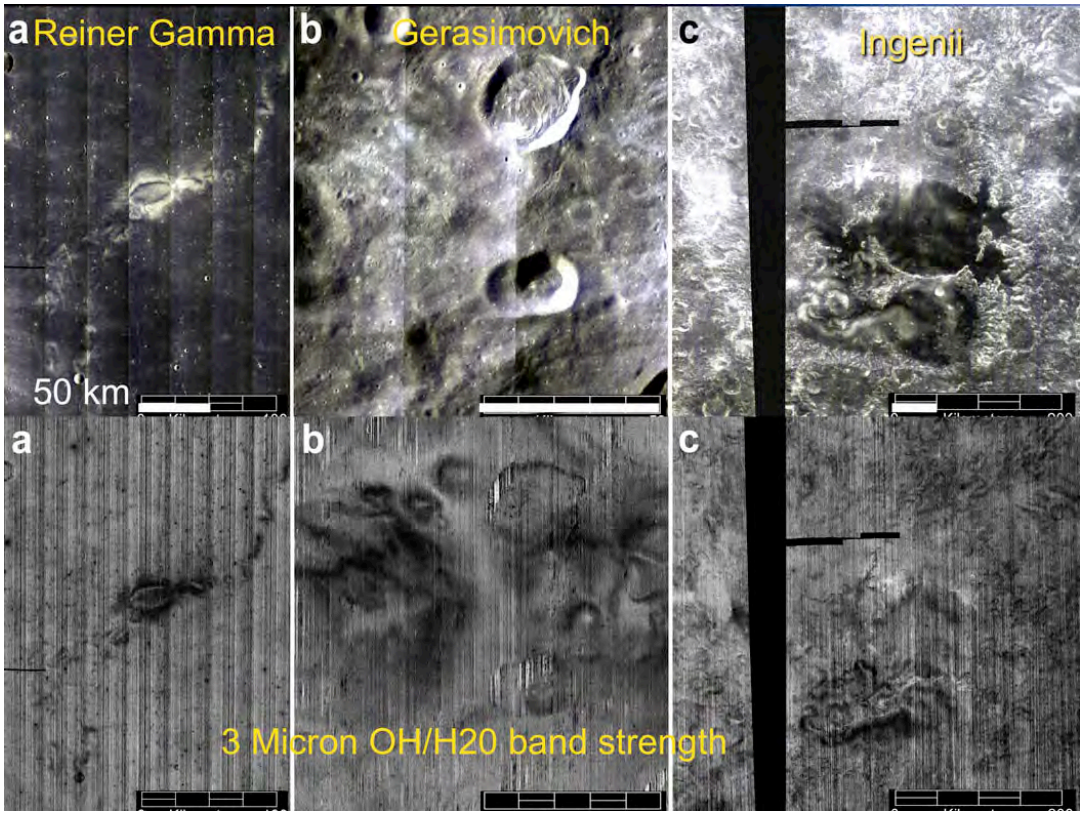

Figure 6. **Dry Swirls**. The high albedo component of lunar swirls are unusually DRY! (linked to local environment). [see Kramer et al., JGR 2011] Scale bar is 50 km in each.