**DIVINER LUNAR RADIOMETER THERMOPHYSICAL AND COMPOSITIONAL RESULTS FROM THE EXTENDED SCIENCE MISSION.**
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**Introduction:** After over four years in operation, and well into its extended science mission, the Diviner Lunar Radiometer has revealed the extreme nature of the Moon's thermophysical properties and surface composition. This presentation will highlight contributions from members of the Diviner Science Team addressing a diverse range of scientific questions from the extended science mission.

**Diviner Lunar Radiometer:** The Diviner Lunar Radiometer is a nine-channel, pushbroom mapping radiometer that was launched onboard the Lunar Reconnaissance Orbiter in June 2009. Diviner measures broadband reflected solar radiation with two channels, and emitted thermal infrared radiation with seven infrared channels [1]. Generally, the three shortest wavelength, narrowband thermal infrared channels near 8 μm are used to constrain composition [2] and the four longer wavelength, broadband channels that span the mid- to far-infrared between 13 and 400 μm and are used to characterize the lunar thermal environment and thermophysical properties [3,4].

Diviner is the first multispectral thermal instrument to globally map the surface of the Moon. To date, Diviner has acquired observations over eight complete diurnal cycles and four partial seasonal cycles (the local time of day processes slowly relative to seasons such that Diviner is typically near a noon-midnight orbit around solstices). Diviner daytime and nighttime observations (12 hour time bins) have essentially global coverage, and more than 80% of the surface has been measured with at least 6 different local times. The spatial resolution during the mapping orbit was ~200 m and now ranges from 150 m to 1300 m in the current elliptical "frozen" orbit. Calibrated Diviner data and global maps of visible brightness temperature, bolometric temperature, rock abundance, nighttime soil temperature, and silicate mineralogy are available through the PDS Geosciences Node [5,6].

**Diviner Foundation Dataset:** A major effort during the extended science mission has been to create a "Foundation Dataset" (FDS) to improve the quality and usability of Diviner data available in PDS. To improve the radiometric accuracy, we reexamined Diviner's pre-flight ground calibration and revised the in-flight calibration methodology [7]. Diviner level 1b activity and quality flags have been modified based on critical reviews from Diviner data users. Finally, we used the new level 1 data to produce a wide range of level 2 and 3 gridded datasets that are more accurate, better organized, and include important geometric and observational backplanes [e.g. 8]. Delivery of the Diviner FDS to PDS is expected to begin in late 2013.

**Thermophysical Properties:** Diviner is directly sensitive to the thermophysical properties of the lunar surface including nighttime soil temperature, rock abundance, and surface roughness [3,4]. During the extended science mission we have produced higher fidelity maps of these properties and used them to investigate anomalous rock aboundances [9], "cold spots" with fluffier surface layers [10], regolith formationa and evolution [11], and surface roughness.

**Compositional Properties:** Diviner was designed to characterize the Christiansen Feature (CF) and constrain lunar silicate mineralogy [2]. Recent efforts in this area have focused on improving the quality of Diviner's mid-infrared "photometric" correction, groundtruthing Diviner observations to Apollo soils [12], using Diviner's longer wavelength channels to improve constraints on olivine [13,14], and combining Diviner with visible and near-infared datasets to enhance interpretations of pyroclastic deposits [e.g. 15], plagioclase-rich regions [16], high silica regions [e.g. 17], and space weathering [18].

**New Observations:** Diviner team members are also using Diviner's spacecraft-independed articulation to target and improve coverage of sites of interst, characterize the surface emission phase function, observe the Earth as an exoplanet, and investigate lunar horizon glow.

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