

Constraints on lunar evolution from LRO Diviner Lunar Radiometer thermal emission observations

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After nearly seven years in operation, and well into its second extended science mission, the Diviner Lunar Radiometer (Diviner) continues to reveal the extreme nature of the Moon's thermal environments, thermophysical properties, and surface composition. This presentation will focus on new observations and recent results and will highlight contributions from members of the Diviner Science Team addressing a diverse range of scientific questions relevant to lunar evolution.

Diviner is the first multispectral thermal infrared instrument to globally map the surface of the Moon. Diviner was designed to accurately measure temperatures across a broad range from midday equatorial regions such as the Apollo landing sites (around 400K), typical nighttime temperatures of less than 100K, and extreme permanent shadowed regions colder than 50K. The coldest multiply-shadowed polar craters may have temperatures low enough to put constraints on lunar heat flow. Nighttime temperatures are driven by the thermophysical properties of the lunar surface, including rock abundance and soil thermal inertia, which are used to investigate impact crater and basin formation and evolution processes. Multichannel thermal infrared spectroscopy can constrain silicate mineralogy, including compositional heterogeneity in the lunar crust.

To date, Diviner has acquired observations over twelve complete diurnal cycles and six partial seasonal cycles. 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 7 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 NASA's Planetary Data System (PDS) Geosciences Node.