

LRO DIVINER LUNAR RADIOMETER GLOBAL MAPPING RESULTS AND GRIDDED DATA PRODUCT. D. A. Paige¹, J. P. Williams¹, M. T. Sullivan¹ and B. T. Greenhagen², ¹UCLA Dept. of Earth and Space Sciences, Los Angeles, CA 90095 dap@moon.ucla.edu, ²Jet Propulsion Laboratory, Pasadena, CA 91109.

Introduction: The Diviner Lunar Radiometer Experiment aboard the Lunar Reconnaissance Orbiter (LRO) has been mapping the moon nearly continuously since July, 2009. The instrument has acquired thermal emission and solar reflectance data in nine spectral channels spanning a wavelength range from 0.3 to 400 microns, at spatial resolutions ranging from 0.2 to 1.3 km [1]. Diviner's unprecedented and growing dataset is revealing the extreme nature of the lunar thermal environment and its diurnal and seasonal variability.

Reduced Data Records: The Diviner Reduced Data Records are archived at NASA Planetary Data System Geosciences node within 3-months of acquisition. Diviner acquires 21 measurements in 9 spectral channels every 0.128 seconds. Each of these measurements generates an RDR record, which includes calibrated radiances and associated ephemeris and geometry information. The data are organized into time-sequenced files containing 10-minutes of data. The Diviner RDR dataset can be downloaded directly from the PDS, or accessed via the web-based PDS Lunar Orbital Data Explorer.

Monthly Maps: During the LRO primary mapping mission, Diviner's principal goal was to acquire a consistent global dataset in pushbroom nadir mapping mode. The LRO orbit plane has an inclination of 90° relative to the lunar equator, and is nearly fixed in inertial space. As the Moon orbits the Earth, the longitudes of the ascending and descending legs of the LRO orbit cycle between 0° and 360° once each month. Diviner naturally acquires two global maps of the moon during each LRO monthly mapping cycle separated by approximately 12 hours lunar local time. As the Earth orbits the Sun, the sub-spacecraft local time during each orbit leg cycles between 0 and 24 hours once each year. Diviner acquires 24 monthly maps of the Moon each year, with each map covering roughly 2 hours of local time. Since Diviner's equatorial swath width is roughly 3.4 km at 50 km altitude, each monthly map contains significant gores at the equator. These gores disappear at latitudes poleward of ~82 degrees.

Gridded Global Dataset. We have used the Diviner reduced data records acquired during the LRO primary mapping mission to create a gridded global dataset. We employ a spatial averaging scheme that projects the Diviner field of views onto a realistic three-dimensional model of the Moon based on LOLA topographic grids [2]. The maps are initially generated

at 1/128 degree resolution, and these master maps are used to create lower-resolution maps at 1/64, 1/16, 1/8, 1/4, and 3/4 degree resolution. This last resolution value produces global lon/lat maps during the LRO primary mission with minimal low-latitude gores. The dataset consists of 35 global mapsets, including 17 daytime mapsets (6-18 hours local time) and 13 nighttime maps (0-6 and 18-24 hours local time). Each mapset includes 12 mapped quantities as described in Table 1. For visual brightness, brightness temperature and bolometric brightness temperature, maps of radiance-weighted average, count and uncertainty are provided. The maps are provided in simple cylindrical lat/lon projections as well as polar stereographic. To be compatible with the LOLA gridded datasets, the Diviner gridded datasets are provided in binary IMG and JPEG2000 formats with appropriate PDS labels.

Table 1. Diviner Gridded Dataset Quantities

Quantity	Average	Count	Uncertainty
Channel 1 Brightness	•	•	•
Channel 2 Brightness	•	•	•
Channel 3 TB	•	•	•
Channel 4 TB	•	•	•
Channel 5 TB	•	•	•
Channel 6 TB	•	•	•
Channel 7 TB	•	•	•
Channel 8 TB	•	•	•
Channel 9 TB	•	•	•
Bolometric TB	•	•	•
Local Time	•	•	
Julian Date	•		

Results: Figures 1-3 show examples of Diviner mapped data products acquired during October, 2009. The gridded datasets will allow significantly enhanced accessibility to the Diviner dataset for most users. The mapped data products may be used on their own, or may be easily imported into geographic information systems to allow overlaying of other mapped datasets. Diviner is also providing mapped products of rock abundance and silicate mineralogy to the PDS in similar formats. The complete set of Diviner mapped products will be available through PDS by mid-March, 2011. The anticipated size of the gridded data product is 3 Tbytes.

References: [1] Paige D. A. et al. (2009) *Space Science Reviews*, DOI: 10.1007/s11214-009-9529-2. [2] Smith D. E. et al. (2010) *GRL* 37, L18204.

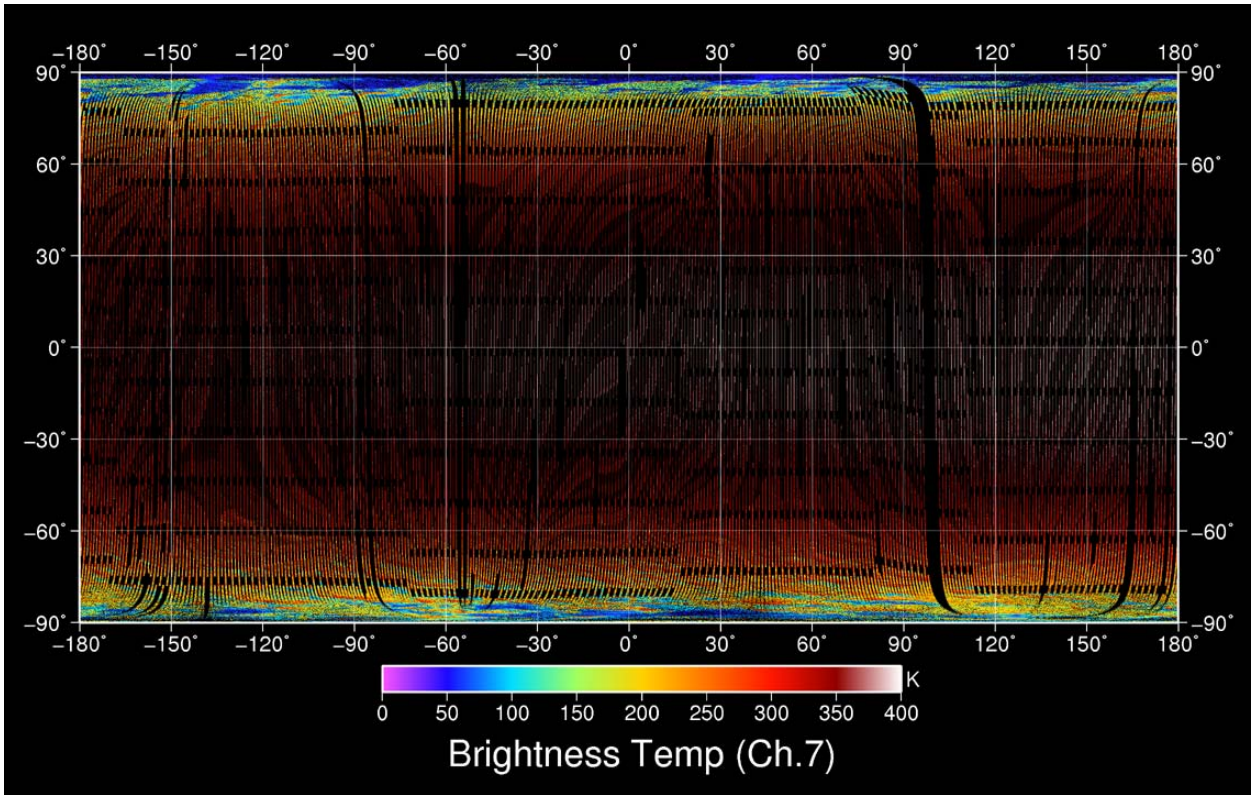


Fig. 1. Diviner Channel 7 gridded daytime brightness temperatures for October, 2009.

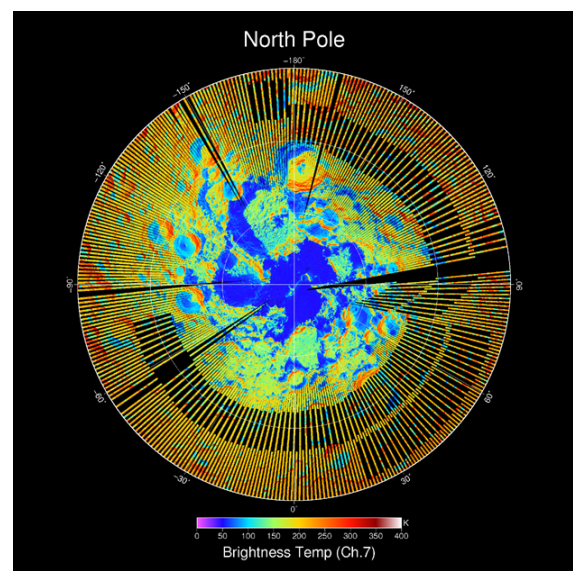
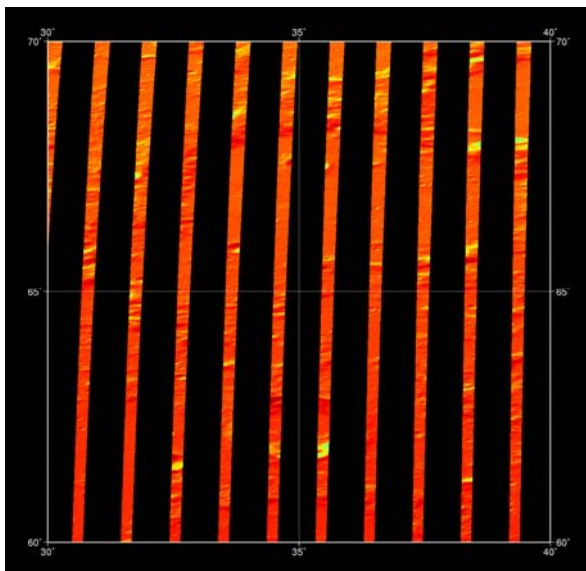


Fig. 2. Close up view of Channel 7 coverage at 65N. **Fig. 3.** Channel 7 north polar stereographic projection.