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Recent Results from the LOLA Instrument on LRO

David E Smith (1), Maria T Zuber (1), Gregory A Neumann (2), Erwan Mazarico (1), and the LOLA Science Team

(1) MIT, Dept of EAPS, Cambridge, United States (smithde@mit.edu, 301-614-6013), (2) Solar System Exploration Division, Goddard Space Flight Center, Greenbelt, USA

The Lunar Orbiter Laser Altimeter (LOLA) on the Lunar Reconnaissance Orbiter spaceraft has been operating nearly continuously in lunar orbit since July 13, 2009. During the first 15 months the objective of the LOLA investigation was to characterize potential future robotic or human landing sites and to provide a precise global geodetic grid of the Moon. Since September 2010 LOLA's primary objective has been the acquisition of altimeter, surface slopes, surface roughness, and reflectance measurements for scientific investigations of the lunar surface. LOLA has so far collected over 3.2 billion precise measurements of lunar elevation and continues to operate acquiring approximately 80 measurements/second. The resolution of the topography of the planetocentric measurements is an average of about 500 meters E-W at the equator and approximately 20 meters along track. Comparison of the lunar radius at Apollo Landing sites (11, 14 & 15) derived from the laser reflectors shows agreement at less than 1 meter. Very high resolution mapping of the polar regions (<10 meters) shows details inside the permanently shadowed craters that have permitted age estimates of some of the freshest looking craters on the Moon. The laser reflectance measurements inside the Shackleton crater at the lunar south pole indicate that it is brighter at 1064 nm than the surrounding area raising the possibility of surface frost, composition, or surface roughness as the source of increased reflectance. Global maps of LOLA topography, surface slopes, roughness and reflectance data sets have been deposited with the Planetary Data System (PDS). The current global grid in the NASA PDS is LDEM_512, and is 16x2 GB with a pixel size in latitude of 59 m. A spherical harmonic expansion of the gridded data to degree and order 720 (spatial block size 7.5 km) has permitted refinement of fundamental parameters of the lunar shape and topography.