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LUNAR TOPOGRAPHY: RESULTS FROM THE LUNAR ORBITER LASER ALTIMETER

Gregory Neumann, gregory.a.neumann@nasa.gov
Goddard Space Flight Center, Greenbelt, MD, Maryland, United States
David E Smith, dsmith@tharsis.gsfc.nasa.gov
NASA/Goddard Space Flight Center, Greenbelt, Maryland, United States
Maria T. Zuber, zuber@mit.edu
Massachusetts Institute of Technology, Cambridge, Massachusetts, United States
Erwan Mazarico, mazarico@mit.edu
Massachusetts Institute of Technology, Cambridge, Massachusetts, United States

The Lunar Orbiter Laser Altimeter (LOLA) onboard the Lunar Reconnaissance Orbiter (LRO) has been operating nearly continuously since July 2009, accumulating over 6 billion measurements from more than 2 billion in-orbit laser shots. LRO's near-polar orbit results in very high data density in the immediate vicinity of the lunar poles, with full coverage at the equator from more than 12000 orbital tracks averaging less than 1 km in spacing at the equator. LRO has obtained a global geodetic model of the lunar topography with 50-meter horizontal and 1-m radial accuracy in a lunar center-of-mass coordinate system, with profiles of topography at 20-m horizontal resolution, and 0.1-m vertical precision. LOLA also provides measurements of reflectivity and surface roughness down to its 5-m laser spot size. With these data LOLA has measured the shape of all lunar craters 20 km and larger. In the proposed extended mission commencing late in 2012, LOLA will concentrate observations in the Southern Hemisphere, improving the density of the polar coverage to nearly 10-m pixel resolution and accuracy to better than 20 m total position error. Uses for these data include mission planning and targeting, illumination studies, geodetic control of images, as well as lunar geology and geophysics. Further improvements in geodetic accuracy are anticipated from the use of refined gravity fields after the successful completion of the Gravity Recovery and Interior Laboratory (GRAIL) mission in 2012.