

Lunar Geodetic Opportunities with the Laser Altimeter on LRO

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The Lunar Reconnaissance Orbiter (LRO) is to be launched at the end of 2008 and will carry 7 instruments, one of which is a laser altimeter (LOLA), and obtain observations of the Moon for a period of 1 year. The orbit will be near polar and approximately circular at 50 km altitude with monthly orbital adjustments to maintain the mean altitude. The LOLA instrument has a ± 10 cm single-shot accuracy, with 5 beams, and operates at 28 Hz. It provides 5 adjacent profiles, each approximately 12 to 15 meters apart with a swath of approximately 65 meters. The 5 beams are arranged in a cross-shaped pattern that provides simultaneous along and cross track altimetry and providing slopes in 2 orthogonal directions every 50 meters along track. In combination with the LRO tracking data LOLA will be used to improve the model of the lunar gravity by using the altimeter on both the lunar near-side and far-side as an additional tracking system to enable precise positioning of the LRO spacecraft at about the 50 meter level rms. The instrument is expected to provide full polar coverage at very high northern and southern latitudes with spatial resolutions of 25 meters or better. In addition to the range to the surface LOLA measures the surface roughness from the spreading of the laser pulse and also the reflectance of the surface at 1064 nm. These measurements in conjunction with the altimetry will assist in the selection of future landing sites for future robotic and human missions to the Moon.