Searching for Lunar Horizon Glow with the Lunar Orbiter Laser Altimeter

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Dust transport on the Moon affects many aspects of lunar surface science, such as the eradication of small craters, rock burial and exposure, and track dating of grains. Moreover, as we learned from the Apollo program, dust is a major obstacle to successful human exploration on the Moon. One observable phenomenon that could yield constraints on dust transport processes is scattered sunlight from exospheric dust grains. The brightest measurements of this lunar horizon glow (LHG) come from Apollo 15 coronal photographs taken from the Command Module at the surface dawn terminator near the time of the Southern Delta Aquariid meteor stream (McCoy 1976; Glenar et al. 2011). However, a variety of other measurements have placed limits on the dust density orders of magnitude below those inferred from Apollo 15 (Glenar et al. 2014; Feldman et al. 2014; Horanyi et al. 2015; Szalay & Horanyi 2015). These observations raise new questions on the temporal and spatial variation of the dust environment, the answers to which have implications for dust transport and planetary exploration, in general.

To address these questions, we are conducting a campaign to search for LHG with the Laser Ranging system (Zuber et al. 2010) of the Lunar Orbiter Laser Altimeter (LOLA) aboard the Lunar Reconnaissance Orbiter (LRO). Advantages of this LOLA LHG search include (1) the LOLA-LR telescope can observe arbitrarily close to the Sun for extended periods without damaging itself or the other LRO instruments, (2) the long time baseline, regular sampling, and campaigns during major meteor showers improve the assessment of temporal variability of LHG, and (3) the observations focus on altitudes < 20 km, the same range as the majority of Apollo 15 measurements. In this contribution, we describe the LOLA LHG search strategy and preliminary results.