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TERRAIN CHARACTERISTICS AND SELECTION OF THE EMIRATES LUNAR MISSION LANDING SITE

Abstract

The Emirates Lunar Mission (ELM) which consists of the "Rashid" rover, equipped with a set of scientific instruments, is foreseen to land in the Lacus Somnorium region of the Moon (Almarzooqi et al., this meeting). We present here the processes which was developed to identify and characterize possible landing ellipses given the technical constraints of the lander and science objectives of the rover. Available remote sensing data-sets from previous and ongoing lunar missions available from the NASA PDS and JAXA SELENE archives were processed and added into a Geographic Information System. Elevation and slope data-sets include: the LOLA/Kaguya merged DEM at approx. 59 m/px, the Kaguya TC DTM built from stereo-images at 7.4 m/px, and NAC DTM built by from the shape from shading techniques by Wöhler et al. (2014) at 1.5 m/px. The main constraint on areas to be considered suitable for landing, is the terrain slope which shall not exceed the maximum slope for safe landing and the stability of the lander. To identify suitable landing ellipses, a statistical analysis of the slope distribution was conducted. Mean, median, 95 and 99^{th} percentiles values of slope, were computed over a moving window of the size and geometry of the landing ellipse. Using a circular landing area of 4 km diameter, it was found that locations South-East of Grove crater (40.3°N 32.9°E) show a 99^{th} percentile slope below 9°. This area is also of scientific interest as it is close to the boundary of highland and mare geological units (see Flahaut et al. , this meeting). Using NAC slope maps or Kaguya DTM, resulted in the same location for best landing ellipse. Roughness and Terrain Ruggedness Index maps computed from NAC DTM, LRO Diviner

rock abundance, mini-RF CPR maps and manual mapping of boulder on NAC images (0.5 m/px to 2 m/px) were also used to determine the presence of cm to m scale objects within the ellipses. Preliminary results suggest the occurrence of only few boulders with spatial extensions of greater 1 m within the currently considered best landing ellipse. With these methodologies using high quality remote sensing data, it was possible to establish a set of quantitative criteria for the identification of suitable landing areas for the upcoming ELM mission.