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GEOLOGY OF THE LACUS SOMNIORUM REGION OF THE MOON, THE EMIRATE LUNAR MISSION PRIMARY LANDING SITE

Abstract

Located between 31-42N, 20-42E on the nearside of the Moon, Lacus Somniorum ("The Lake of Dreams") is a vast volcanic plain with irregular and unclear boundaries. Little is known about this feature stretching north of Mare Serenitatis. This region which is shown in the existing, global-scale geological maps, as boundary area between different geological units, promising on small spatial scales the presence of different geological properties. As its terrain is found suitable for landing, this area was selected as the primary landing zone for the Emirate Lunar Mission (ELM) (see Breton et al., this meeting). This paper presents new findings regarding the composition, age, and geologic history of the ELM landing area. Available remote sensing datasets from past and ongoing lunar missions (LOLA, LROC WAC and NAC, LRO mini-RF and Diviner, Kaguya TC and MI, LP GRS, Clementine, Ch-1 M3) were downloaded from the NASA Planetary Data System and JAXA's SELENE Archive, processed and integrated into a Geographic Information System (GIS) (see Schnuriger et al., PSS2020 for example). Optical and multispectral imagery were used to draw a regional geologic map, outlining the existence of at least four distinct mare units, surrounded by more feldspathic materials ejected from large impact craters. Crater mapping was performed at the WAC scale in order to determine the age of the mare units, which is estimated to 3.7 Ga for the mare unit located southeast of Grove crater, where the candidate landing ellipses are located. Clementine data suggest FeO and TiO2 contents for this specific mare unit of 12 weight percent and 1 weight percent, respectively. These values are relatively low compared to most lunar maria and suggest that either 1) this mare unit is of unusual chemical composition or 2) the mare material in this region is mixed up and contaminated by highland material. Hyperspectral data from the

M3 instrument confirm the presence of pyroxene absorption bands, consistent with pigeonite and augite, a mineral whose signature is commonly observed in lunar basalts. The geologic evolution of this relatively unknown and unexplored region of the Moon will be further discussed at the conference.