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MARIUS HILLS REGION, MOON: Stratigraphy of low shields and mare basalts

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MARIUS HILLS REGION, MOON: STRATIGRAPHY OF LOW SHIELDS AND MARE BASALTS. J. Gebhart1, H. Hiesinger1, C. H. van der Bogert1, J. H. Pasckert1, J. Weinauer1, S. J. Lawrence2, J. D. Stopar2, and M. S. Robinson2, 1Institut für Planetologie, Westfälische Wilhelms-Universität Münster,Wilhelm-Klemm-Str. 10, 48149 Münster, j_gebh02@uni-muenster.de, 2Arizona State University, Tempe, AZ, USA

The Marius Hills region consists of more than 250 individual basaltic low shields (usually referred to as "domes") and cones, located on a broad topographic rise. The bases of numerous low shields have slope angles of ∼2-3° whereas the upper portions have slopes of ∼6-7° [1], interpreted to reflect changes in composition over time [1]. However, the absence of spectral differences between the two dome morphologies and the surrounding mare basalts suggests that the observed morphologies are more plausibly explained by changes in effusion rates, temperature (viscosity), and/or crystallization over time [e.g., 2]. Previous studies indicate that volcanism in this region occurred in the Upper Imbrian (3.2-3.8 Ga) [3], although several other authors reported ages ranging from the Imbrian (∼3.3 Ga) to the Eratosthenian (∼2.5 Ga) [e.g., 1,2,4]. [2,5] reported that all low shields are embayed by younger mare units, indicating that they formed during an older stage of volcanic activity. Mare basalts surrounding the Marius Hills exhibit absolute model ages of 1.2-3.7 Ga [6]. We used 36 LRO NAC images to perform crater size-frequency distribution (CSFD) measurements. The images were calibrated and map-projected with ISIS 3 and imported into ArcGIS. Within ArcGIS, we used CraterTools [7] to perform our CSFD measurements. The crater size-frequency distributions were then plotted with CraterStats [8], using the production and chronology functions of [9]. We conducted CSFD measurements for 50 Marius Hills low shields. Our count area sizes ranged from 1.06 x 101 to 8.75 x 101 km2; those for adjacent basalts varied between 6.17 x 100 and 8.01 x 101 km2. We determined absolute model ages (AMAs) of 1.03 to 3.65 Ga for the low shields and did not find a spatial correlation of ages versus their locations. CSFD measurements for 27 adjacent basalts show AMAs of 1.20-3.69 Ga. Of those basalts, 24 exhibit AMAs of 3-3.5 Ga; there is no correlation of AMAs and the geographic position of the dated basalts. We find that in several cases the low shields are younger than their adjacent mare basalts. However, the stratigraphic relationships might be more complicated because [2,5] observed that basalts embay the low shields. Thus, further studies are required to unambiguously constrain the stratigraphic relationships and to characterize possible effects of small count areas and topography on the determination of AMAs with CSFD measurements. Provided the AMAs were not affected by the relatively small size of the count areas and topographic slopes, these results imply that the volcanic activity in the Marius Hills region lasted > 1 Ga longer than previously thought [e.g., 4].

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