DEEP CRUSTAL LUNAR LITHOLOGIES EXPOSED IN THE SOUTH-WESTERN PEAK RING OF THE SCHRÖDINGER BASIN

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Material uplifted from a depth of tens of kilometres in Schrödinger basin's peak ring (Kramer et al., 2012, Fig. 1) provides an opportunity to test the lunar magma ocean hypothesis and makes it a compelling site for future lunar surface operations. The purpose of this poster is to present a geological map of Schrödinger's south-western peak ring, interpret exposures of south polar crustal lithologies and structural features, and provide information needed for future mission planning.

Methods: The individual Lunar Reconnaissance Orbiter Narrow Angle Camera (LROC NAC) strips were located using the ACT-REACT Quick Map tool and were mosaicked in ISIS. The mineral map (Fig. 3) derived from Moon Mineralogy Mapper (M^3) spectra (Kramer et al., 2012) and the mosaic, centered at 75.34°S, 124.87°E (Fig. 2), were used as reference layers to identify and map all the lithological contacts and structural features in the south-western peak ring in ArcGIS 10.

Results and Discussion: Figure 4 shows that the south-western peak ring of Schrö- dinger basin is composed of 3 major lithologies: norite, troctolite, and anorthosite, which occur as isolated massive cumulates. Also, some structural boundaries, like faults 1 and 2, which divide this section of the peak ring into three massifs, offset deep crustal lithologies. Likewise, the graben (H in Fig. 4) cuts through and offsets outcrops of troctolite and norite in the middle massif.

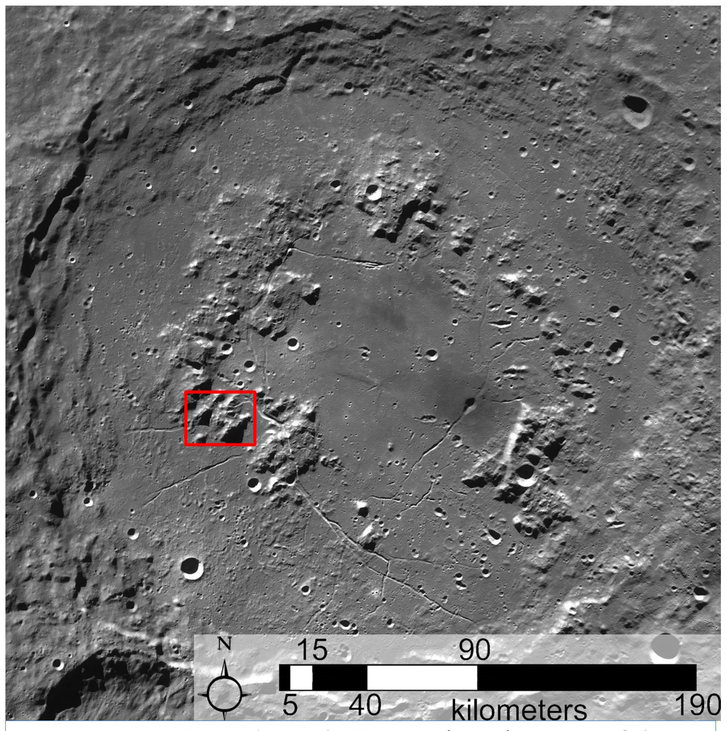

Figure 1. An LROC Wide Angle Camera (WAC) mosaic of the Schrödinger Basin with the region of interest (ROI) shown by the red box.

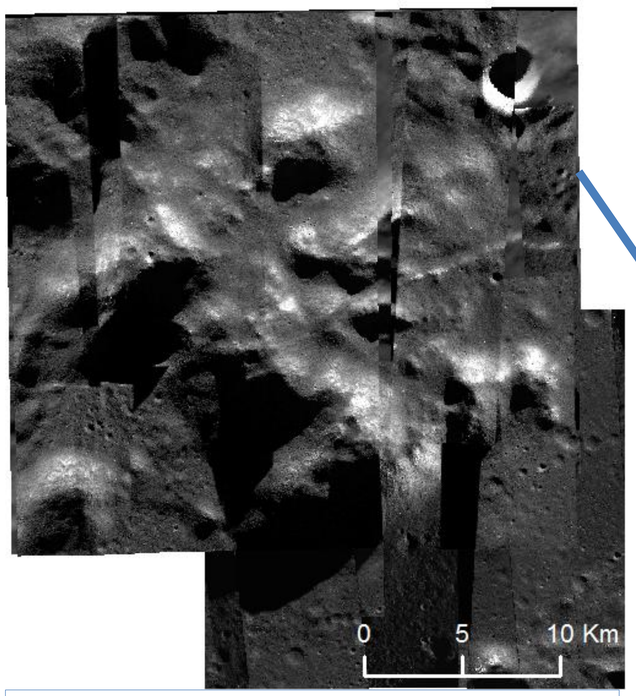

Figure 2. An LROC NAC mosaic of the south-western peak ring of the Schrödinger basin created in ISIS.

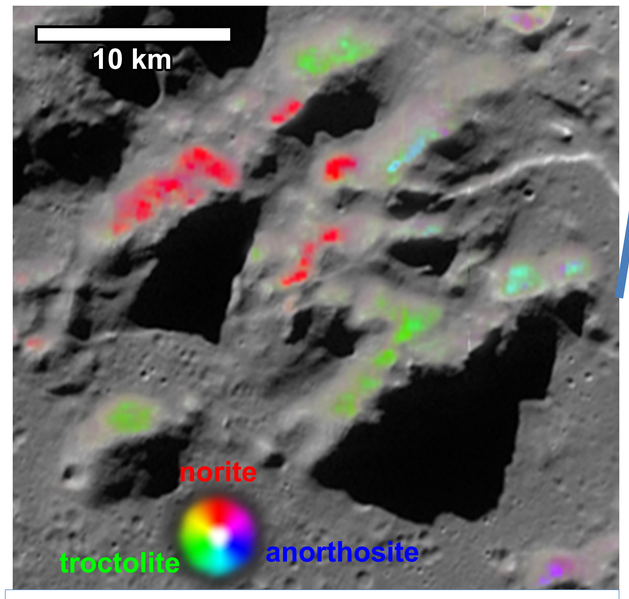

Figure 3. M^3 mineralogy map of the ROI from Kramer (2012) at http://www.lpi.usra.edu/meetings/lunarhighlands2012/pdf/9013.pdf

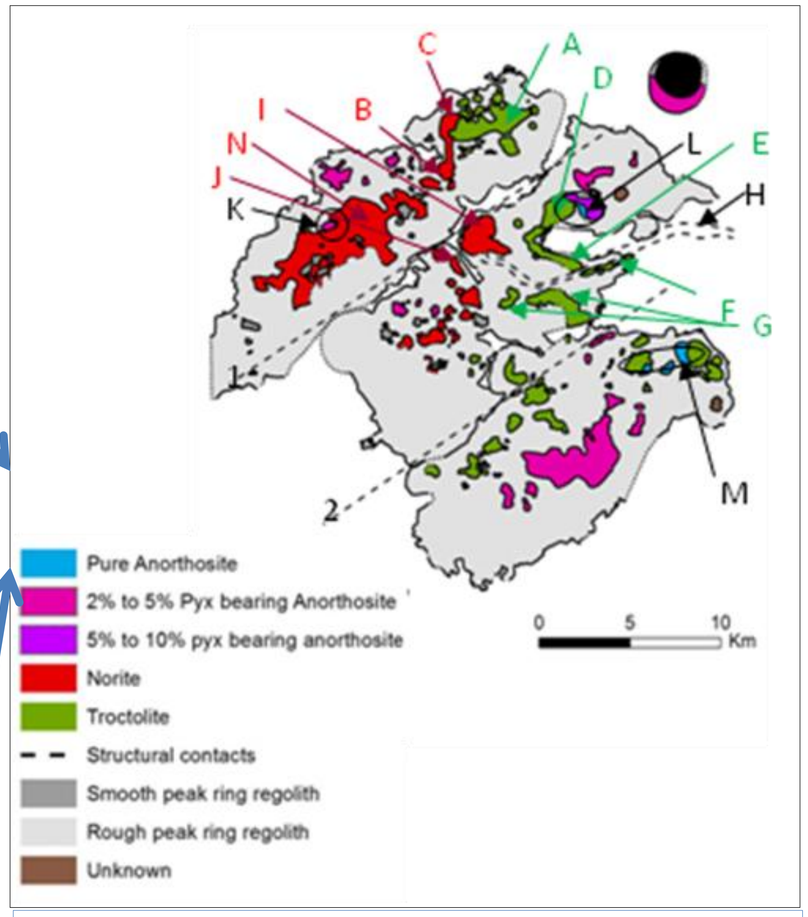

Figure 4. Generated map of the south-western peak ring of the Schrödinger basin in ArcGIS 10.

Norite is clearly distinguishable from other lithologies. At hill N, the regolith covering makes it look darker. The edge of troctolite hill A contains norite boulders due to their scattering (evidenced by a trail at location C from figure 4) by downslope weathering from block B in figure 4. The graben H appears to have separated the norite mounds I and J. Troctolite identified in spectra from the northern division exhibits spectral features of olivine and plagioclase. It was observed that outcrops farther south become olivine rich (block D in Fig. 4). An increasing amount of plagioclase can be seen in the spectra of the troctolite hills E and F (Fig. 4). Hills E, F and G exhibit similar spectral features. But the graben H disconnects hills F and G from block E. Anorthosite occurs as pure anorthosite traces in cumulates of pyroxene-bearing anorthosite in all three divisions. However, three different transitions of lithologies were observed on the map (Fig. 4) at locations K, L and M. The grey area in figure 4 is the peak ring regolith.

The occurrence of large amounts of troctolite formations observed at various places in the peak ring either represent a primary igneous lithology or a comingling of cumulate olivine and plagioclase during peak ring formation. The lithologies can be used as proxies in providing information about the lunar interior, i.e., potentially the crust-mantle interface, as Schrödinger basin's peak ring has been found to contain uplifted material from 50 km depth.