GEOLOGIC MAPPING OF THE ARISTARCHUS PLATEAU REGION ON THE MOON. T.A. Lough[1], T.K.P. Gregg[1], and R. Aileen Yingst[2]; [1]411 Cooke Hall, Geology Dept., University at Buffalo, Buffalo, NY 14260 (talough@buffalo.edu), [2]2420 Nicolet Dr., Natural and Applied Sciences, University of Wisconsin-Green Bay, WI 54311.

Introduction: Aristarchus plateau (~25ºN, 40ºW) is a volcanologically diverse region containing sinuous rilles, volcanic depressions, mare material of various ages—including a candidate for the youngest mare unit on the lunar surface—pyroclastic deposits, and material of possible highland origin [1-5]. Here, we present preliminary mapping of a 13° x 10° area around Aristarchus plateau [6]. Interpretations of the region's volcanic evolution have implications for the global history of lunar volcanism, the crustal and mantle development of the Moon, and may ultimately help support successful lunar exploration [7].

Background: The map area contains: mountainous highland terrain; primary and secondary impact craters; the highest concentration of sinuous rilles on the Moon (probably lava channels and/or collapsed lava tubes); volcanic depressions and hills [1]; lava flows ranging in age from possibly as young as 1.2 Ga to >3.4 Ga [2]; and a blanket of dark mantling material interpreted to be pyroclastic deposits [e.g., 3-5]. Kiefer [8] found positive gravitational anomalies on the eastern and southern margins of the plateau that may correlate with a magma intrusion. Radon detection around the region suggests it is still degassing [8, 10].

Researchers created several geologic maps of the Aristarchus region using Apollo-era data [e.g., 11-13] as well as compositional maps from ground-based radar and orbital remote sensing data [e.g., 14-16]. The map presented here combines new observations with previous mapping results to more accurately assess volcanic timing and emplacement mechanisms.

Methods: The USGS provided orthorectified digital basemaps of the Lunar Orbiter (LO) and Clementine data sets and a geodatabase containing the features used to map the Copernicus quadrangle [17]. The basemap is mosaicked Lunar Orbiter IV and V images because: 1) they are the highest resolution comprehensive dataset available (~1 - ~150 m/pixel); and 2) low sun angles highlight morphologic and topographic features. We also consulted iron and titanium ratio maps [18] as well as high-resolution Apollo and LO images.

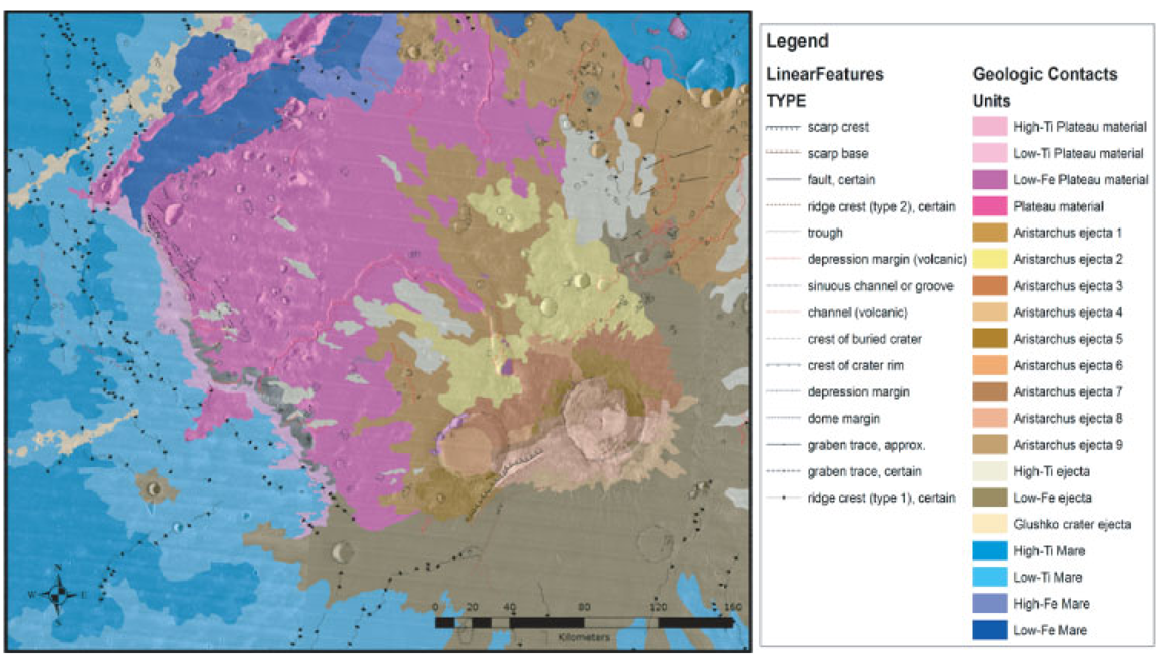

Figure 1. Preliminary geologic map of the Aristarchus plateau region superimposed on a Mercator projection of the Lunar Orbiter mosaicked basemap. Mare units are in shades of blue, plateau units are in shades of pink, and ejecta units are in shades of brown. Upper left is 30ºN,58ºW; lower right is 20ºN,45ºW.

Units: They are defined based on their spectral and morphological characteristics. We have identified three unit types: Mare material, Plateau material, and Ejecta material. Four mare units surround Aristarchus plateau, filling topographically low areas. The four plateau units range from relatively low Fe content and high albedo to high Ti and low albedo. Two plateau units sandwich the plateau's margin. The "inside" unit has relatively high Ti content whereas the "outside" unit has relatively low Ti content. Twelve ejecta units comprise Aristarchus crater ejecta as well as ejecta from smaller local impacts, and ejecta rays from Glushko crater. The ejecta units are based on target-material composition, albedo, and deposit texture. Two Aristarchus crater ejecta units share spectral characteristics with smaller impact craters and are interpreted to be one or more excavated subsurface layers continuous across the region.

Structures: We have identified the following features within the Aristarchus plateau map area.

Sinuous rilles are concentrated in the northeastern corner and typically radiate away from the plateau. Secondary orientation trends align with local features such as impact crater rims and fractures [19]. Rilles range from <5 km to >310 km long. Only Schröd-inger Valley contains a younger rille cutting the primary rille floor.

Hills. Two hills with spectral characteristics congruent with the surrounding unit are identified within the map area (23.3ºN, 47.6.0ºW and 20.3ºN, 50.0ºW). The first is in Aristarchus ejecta 1. It is ~3 km in diameter and within 1 km of the source crater for a sinuous rille. This feature may be highland material mantled by a fluid, low-viscosity, mafic lava or by a mafic regolith, or a volcanic construct. The second hill is within the Low-Fe ejecta unit. It is ~11 km in diameter with a ~ 3 km diameter irregular depression slightly southeast of the center of the hill.

Irregular Depressions are typically situated at rille heads. Irregular depressions are also present in a heavily fractured region adjacent and parallel to the northwest plateau margin.

Mare-type Wrinkle Ridges display complicated cross-cutting patterns, typically trending from the northwest to the southeast. Krieger crater crosscuts a wrinkle ridge with a northeast/southwest orientation. Wrinkle ridges within ~40 km of the plateau parallel the plateau margins.

Linear Features: Linear troughs cross-cut and parallel sinuous rilles in the northeast. These troughs are interpreted to be fractures, many of which appear to have provided a path for rille-forming lava. Linear to sub-linear troughs cover ~ 30 km of the southwest edge of the plateau and run parallel to its margin. These depressions modify craters (e.g., Raman crater) and are the origin for several volcanic depressions and sinuous rilles.

Aristarchus Crater: (Figure 2). Channels within Aristarchus crater cut through all units and structural features. These channels locally feed relatively smooth flat-lying deposits on the crater rim, wall terraces, or floor, and are interpreted to be impact-melt channels and ponds.

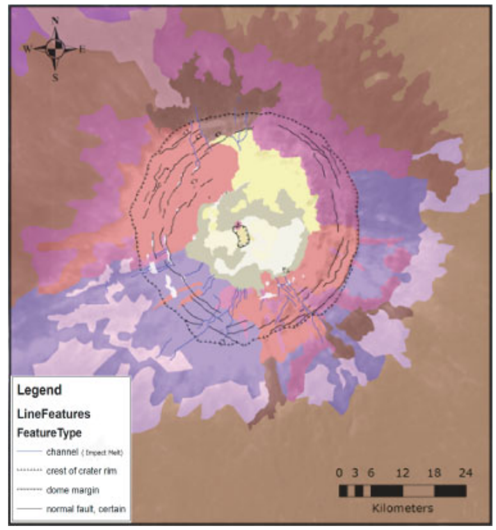

Figure 2 Units and features in the map are-aare superimposed on a Mercator projection of the Lunar Orbiter mosaicked basemap.. Ejecta units are shown in pink shades and floor units are shown in yellow shades.

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