A CLPS EXPLORATION CAMPAIGN AT THE ARISTARCHUS PLATEAU. T. D. Glotch[1], E. R. Jawin[2], B. T. Greenhagen[3], J. T. Cahill[3], D. J. Lawrence[3], R. N. Watkins[4,5], D. P. Moriarty[6], N. Kumari[1], S. Li[7], P. G. Lucey[7], M. A. Siegler[8,9], J. Feng[8], L. B. Breitenfeld[1], C. C. Allen[10], H. Nekvasil[1], D. A. Paige[11], [1]Stony Brook University (timothy.glotch@stonybrook.edu), [2]Smithsonian Institution, [3]Applied Physics Laboratory, [4]Arctic Slope Regional Corporation Federal, [5]NASA Headquarters, [6]NASA Goddard Space Flight Center, [7]Hawaii Institute of Geophysics and Planetology, University of Hawaii at Manoa, [8]Planetary Science Institute, [9]Southern Methodist University, [10]NASA Johnson Space Center, [11]UCLA

Introduction: The Aristarchus plateau hosts a diversity of volcanic features, including the largest pyroclastic deposit on the Moon, the largest sinuous rille on the Moon, and intrusive and extrusive examples of evolved, Th-rich silicic lithologies. The rich diversity of volcanic features on the Aristarchus plateau presents an opportunity for a sustained science and exploration program. We suggest a series of missions to the Aristarchus crater floor or ejecta, the Cobra Head, and Herodotus Mons to investigate the link between pyroclastic, effusive basaltic, and silicic volcanism in the region. Such missions would enable analyses of rocks that are rare in the Apollo sample collection and demonstrate in situ resource utilization of FeO- and H_2O-bearing pyroclastic materials.

Site Overview: The major features of the Aristarchus Plateau are shown in Figure 1 [1]. The plateau hosts the largest pyroclastic deposit [2] and widest and deepest sinuous rille, Vallis Schröteri, on the Moon. The pyroclastic deposit hosts up to 500 ppm of endogenous H_2O [3], while Vallis Schröteri terminates in the potentially very young P60 mare basalt unit [4]. Exposed on the plateau are also numerous features with evolved silicic compositions, including the floor and ejecta of Aristarchus crater, the Cobra Head, Väisälä crater, Herodotus Mons, and portions of the Montes Agricola [1,5].

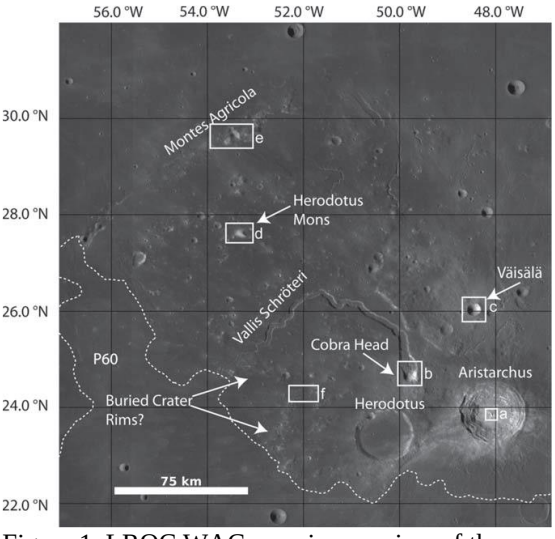

Figure 1. LROC WAC mosaic overview of the Aristarchus Plateau region, with major features labeled. After [1].

Science Questions Addressed with an Exploration Campaign: We propose a campaign of exploration at the Aristarchus Plateau composed of no fewer than 3 CLPS missions targeted to the Aristarchus Crater floor, the Cobra Head, and the Herodotus Mons/pyroclastic deposit boundary. Mobility would substantially enhance the science return from each mission, and sample return would enable transformational science focused on materials that are rare or absent in the Apollo sample collection. Motivating science questions for the Aristarchus Exploration Campaign include, but are not limited to: (1) How are large-scale granitic/rhyolitic compositional features on the Moon generated in the absence of plate tectonics? Do they reflect hot-spot processes as seen on Earth? (2) Is there any field evidence for a relationship between the basaltic and silicic materials? What petrologic processes would indicate that they could or could not be related, and what do these inferences imply about the lunar interior? (3) Is there a gradation in silicic compositions that is not discernible from orbit due to limited spectral and/or spatial resolution? What lithologies are represented by the silicic material (e.g., trachytes, syenite, potassic granite, potassic rhyolite)? Are there intermediate compositions? (4) What do the correlations between SiO_2 content, Th, and/or H_2O tell us about lunar interior composition and evolution? (5) Are there coatings on the pyroclastic materials that can tell us about volatiles (other than H_2O) in the lunar interior? (6) How do the textures, crystallinity, and compositions of the pyroclastic materials and basaltic lava flows in the region differ, and could they have been sourced from the same eruptive center(s)? Each of these questions could be addressed through analyses of pyroclastic, basaltic, and silicic materials on the Aristarchus plateau by one or more missions.

References: [1] Glotch, T. D. et al. (2021), *PSJ*, 2, 136. [2] Gaddis, L. R. et al. (2003), *Icarus*, 161, 262. [3] Milliken, R. E. and S. Li (2017), *Nat. Geosci*, 10, 561. [4] Hiesinger H. et al. (2011), *GSA Special Paper* 477. [5] Glotch, T. D. et al. (2010), *Science*, 329, 1507.