GRUITHUISEN DOMES: SILICIC VOLCANIC CONSTRUCTS ON THE MOON. N. Kumari[1], T.D. Glotch[1], J.-P. Williams[2], B.T. Greenhagen[3], S. Li[4], D. Waller[3], Tyler Powell[2], K.A. Shirley[5] and M.T. Sullivan[2] ,[1]Dept. of Geosciences, Stony Brook University, Stony Brook, NY, nandita.kumari@stonybrook.edu, [2]Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles, CA, [3]Johns Hopkins University Applied Physics Laboratory, Laurel, MD, [4]University of Hawaii, [5]Department of Atmospheric, Oceanic, and Planetary Physics, University of Oxford, Oxford, UK.

Introduction: The Gruithuisen domes are a collection of three domes referred to as the Gamma, Delta, and Northwest domes. These domes have low FeO wt% (<5 wt%), low Christiansen Feature (CF) positions (~6.9-7.5 μm) and elevated potassium and thorium abundances (Fig. 1a, b,e,f) indicative of potentially KREEP induced silicic volcanism[1-4]. The domes have heights of ~ 2 km and ages of ~3.8 Ga [5] and are located in the Oceanus Procellarum KREEP terrain surrounded by basaltic lava flows. The domes have long been an enigma to the lunar community due to their apparent SiO_2-rich composition and formation in the absence of plate tectonics. As a result, NASA will send a CLPS mission to the domes in early 2025 to explore the region and understand it better. We are carrying out a detailed study of the region from all the available remote sensing datasets to identify locations of interest and prepare for the lander/rover exploration in the region to maximize the scientific output.

Results: In addition to the previously identified domes, there is a small region to the west, which also has low CF and low FeO. The region also has high water abundance (>100 ppm) in the nearby regions.

It is possible that this region is part of a larger pyroclastic deposit that was subsequently buried by impact ejecta and later mafic lava flows. Despite the presence of a weak magnetic field of ~1nT to 3nT in the region, the water abundance is relatively high which might be another indicator of presence of pyroclastic deposits in the nearby region. While the domes do not show high rock abundances (Fig1.d), we have mapped ~40,000 boulders on top of Gamma dome alone. These boulders are both potential hazards for the upcoming CLPS mission and potentially valuable science targets.

Future Work: We will investigate boulder breakdown in the region to further understand their dependence on the properties of the base material and finish the boulder mapping to identify hazardous sites for landing and roving in the region.

References: [1] Glotch T.D. et al (2011), GRL,38(21) [2] Greenhagen B.T. et al (2010), Science 329, no.5998 [3] Lemelin M. et al (2016), 47th LPSC abs#2994 [4] Hagerty J.J., et al (2006), JGR, 111,E06002, doi:10.1029/2005JE002592 [5] Ivanov M.A et al (2016), Icarus, 273, 262-28

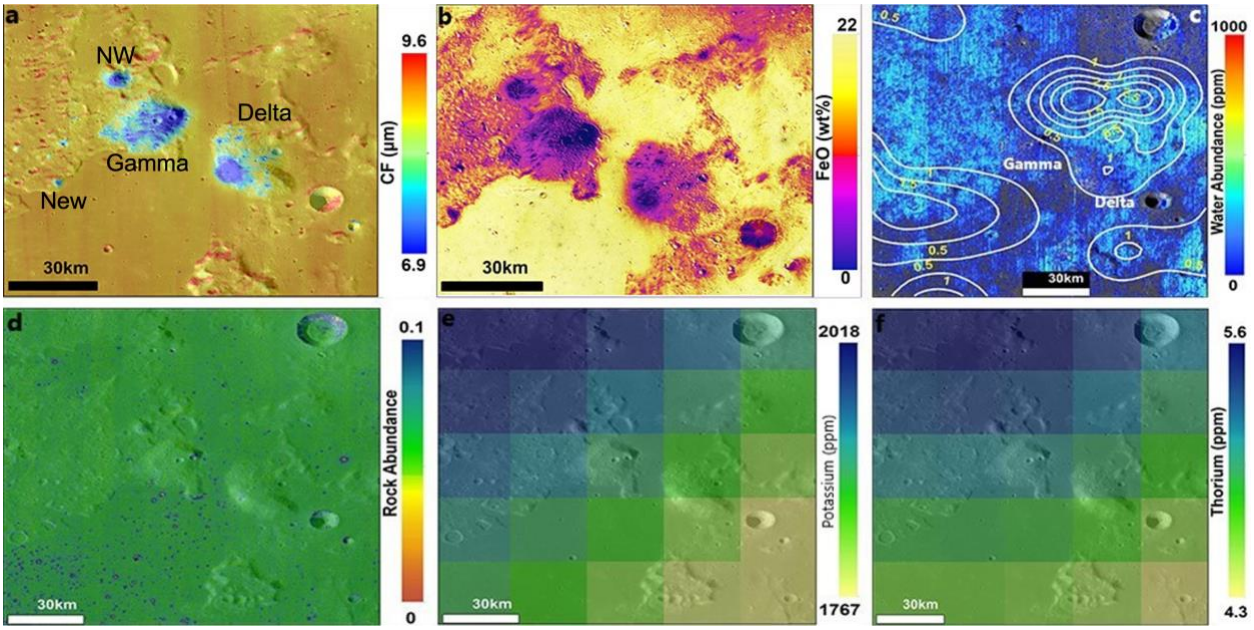

Fig. 1 *a) CF map with low CF values on the domes corresponding to high silica content b) FeO map with low FeO wt% material excavated by the young craters on top of the domes indicating low iron content c) Water abundance map overlaid by the surface magnetic field strength contours indicating presence of a weak magnetic field d) Rock Abundance map e) Potassium abundance map f) Thorium abundance map*