SMALL-SCALE THORIUM ANOMALIES ON THE MOON AND POSSIBLE VOLCANIC CONNECTIONS. C. Lauber, M. Zanetti[1], B. L. Jolliff[1], [1]Dept. of Earth & Planetary Sciences and the McDonnell Center for the Space Sciences, Washington University, One Brookings Drive, St. Louis, MO 63130. (clauber@wustl.edu).

Introduction: One of the advances enabled by the Lunar Reconnaissance Orbiter (LRO) Camera images is the capability to investigate, at high spatial resolution, the surface features on the Moon that may be responsible for various remotely-sensed compositional data. In this abstract we focus on features on the surface that may be responsible for small-scale enhancements of Th concentrations as measured by the Lunar Prospector gamma-ray spectrometer (LP-GRS) [1].

Large-scale Th anomalies have been associated with surface features, including ejecta deposits from Imbrium basin, and exposures of silicic volcanic materials. Examples of the latter include the Mairan Domes, Gruithuisen Domes, Aristarchus Crater, and the Compton Belkovich and Hansteen-Alpha volcanic complexes [2-6]. Other small-scale Th anomalies were investigated by Lawrence et al. [2] and Hagerty et al. [3]. In this abstract we present results of investigations of several small-scale Th anomalies with an eye to associated small volcanic features because of the link between Th anomalies and silicic volcanics [3-7].

Methods: We used LRO Wide Angle Camera (WAC) and Narrow Angle Camera (NAC) images [8] to investigate surface features in areas of small-scale Th anomalies. Image processing is done using ISIS programs [9]. We have also used the GLD100 digital topographic model, derived from WAC images [10] to visualize topography in areas of interest on the lunar surface. To aid our correlation of small-scale Th enhancements and surface features, we visualized image and Th data using ACT-REACT software [11]. We leveraged the capability of this software to rescale data "on the fly" as we zoom or move scenes. This method allows us to locate small-scale Th enhancements efficiently and to then use the layered data set to correlate enhancements to features seen in WAC and NAC images and GLD100 topography.

Investigating local Th hotspots: Numerous small-scale Th anomalies were identified previously and characterized by [2,3]; we have looked in and around these same areas as well as other areas not included in those studies. We found several anomalies that have small topographic features near their centers at several sites, and four of those sites are highlighted here. They are (1) the J. Herschel domes located in J. Herschel Crater north of Imbrium, (2) Messala-Gauss Anomaly, (3) Laplace Mound, and (4) a mound southwest of Webb U crater in Mare Fecunditatis (Fig. 1). All four locations have positive relief features ranging from ~500×500 m to ~10×10 km, and all are found in mare settings. These features lie at or near the centers of minor Th enhancements, but are smaller than the resolution of the Th data, thus we infer that they may consist of much higher Th concentrations such as are found associated with lunar granite [3]. Large boulder concentrations are present at all four of these features, with the highest concentrations at the J. Herschel mound. Boulders are also observed at domes in areas of Th-rich, silicic volcanics such as at the Compton-Belkovich volcanic complex [5,12].

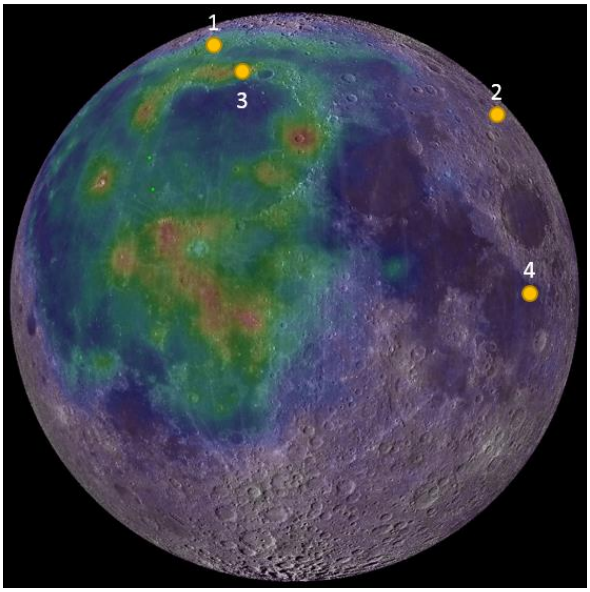

Figure 1: Location of Th anomalies associated with dome-like features (LP-Th over global WAC mosaic)

Preliminary Assessment: From the co-location of these small positive topographic features and minor Th enhancements, we suggest these features might be to be small silicic volcanic constructs. In some cases, they occur beyond the area where most of the larger features are found, meaning that the process leading to this form of volcanism, which requires extended fractional crystallization or remelting of crustal materials, may be more widespread on the Moon than previously thought.

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Geosci. **4**, 1151–1154. [6] Hawke B. et al. (2012) LPS 43, #1754. [7] Lawrence, D. et al. (2007) *Geophys. Res. Lett.* **34**, L03201. [8] Robinson, M., et al. (2010) *Space Sci. Rev.* **150**, 81-124. [9] Anderson J., et al. (2004) LPSC XXXV, #2039. [10] Scholten F. et al. (2012) *J. Geophys. Res.* **117**, E00H17. [11] ACT-REACT™ by Applied Coherent Technology Corporation [12] Accardo et al. (2012) *Lunar Planet. Sci.* 43, #1656.

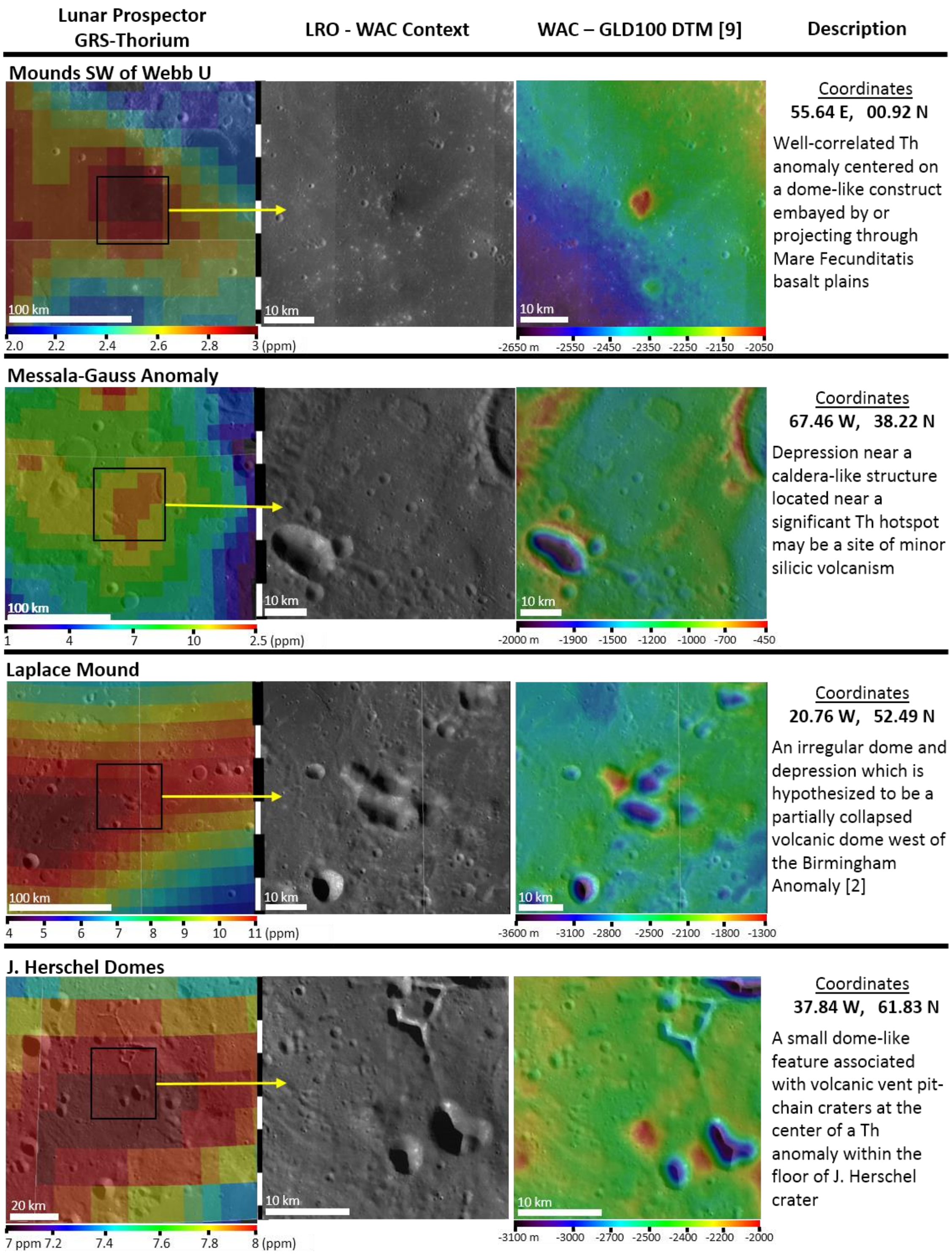

Figure 2: Locations of small thorium enhancements associated with dome-like features, that are possible indicators of minor silicic volcanism. Lunar Prospector thorium data compared with WAC imagery and WAC stereo DTMs from [10].