**FIELD AND GEOCHEMICAL STUDY OF TABLE LEGS BUTTE AND QUAKING ASPEN BUTTE, EASTERN SNAKE RIVER PLAIN, IDAHO: AN ANALOG TO THE MORPHOLOGY OF SMALL SHIELD VOLCANOES ON MARS.** S. M. Brady[1], S. S. Hughes[1], S. E. H. Sakimoto[2], and T. K. P. Gregg[3] [1]Dept. of Geosciences, Idaho State Univ., Box 8072, Pocatello, ID 83209, bradsha2@isu.edu and hughscot@isu.edu, [2]GEST at the Geodynamics Branch, Code 921, NASA GSFC, Greenbelt, MD 20771, [3]Dept. of Geological Sciences, the Univ. at Buffalo, SUNY, 876 Natural Science Complex, Buffalo, NY 14260.

**Introduction:** Mars Orbiter Laser Altimeter (MOLA) data allows insight to Martian features in great detail, revealing numerous small shields in the Tempe region, consisting of low profiles and a prominent summit caps [1]. Terrestrial examples of this shield morphology are found on the Eastern Snake River Plain (ESRP), Idaho. This 'plains-style' volcanism [2] allows an analog to Martian volcanism based on topographic manifestations of volcanic processes [1, 3-6]. Recent studies link the slope and morphology of Martian volcanoes to eruptive process and style [1, 3-6]. The ESRP, a 400km long, 100km wide depression, is host to hundreds of tholeiitic basalt shields, which have low-profiles built up over short eruptive periods of a few months or years [7]. Many of these smaller scale shields (basal diameters rarely exceed 5km) display morphology similar to the volcanoes in the Tempe region of Mars (Figure 1, 2). Morphological variations within these tholeiitic shields are beautifully illustrated in their profiles.

**ESRP shield with topographic caps:** Table Legs Butte and Quaking Aspen Butte are examples of ESRP shield with topographic caps at their vents. The caps of these monogenetic volcanoes contain spatter-like to block-like flows. There is an overall fining of groundmass, and a slight decrease in vesicle and phenocryst concentration further from the summit. Geochemical and stratigraphic studies of the ESRP lava flow groups argue for individual magma batches in the case of these low-profile basaltic shields. Contrary to most fine-grained ESRP tholeiites, Table Legs Butte lava contains, on average, over 25% "phenocrysts" (not exceeding 2cm in size), dominated by skeletal plagioclase laths and a small percentage of olivine phenocrysts (Figure 3). High concentrations of Fe-Ti oxides dominate the fine-grained groundmass, especially skeletal ilmenite microphenocrysts. All Table Legs Butte flows display diktytaxitic textures that may reflect significant sub-aerial growth of plagioclase laths. Segregation structure in many ESRP tholeiites commonly consist of coarse diktytaxitic textures.

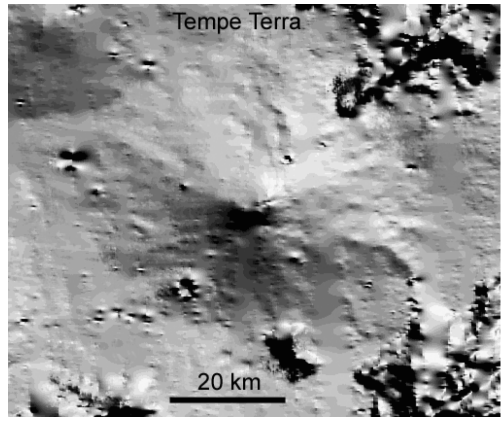

Figure 1: Shaded relief image for a shield with a distinct cap, Tempe Terra region of Mars.

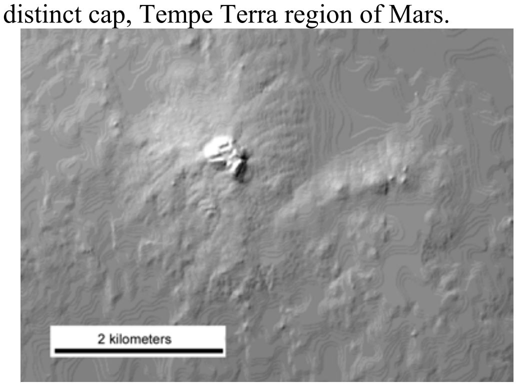

Figure 2: Shaded relief image of Table Legs Butte, near Atomic City, Idaho. Distal flows extend to the south.

Table Legs Butte segregation structures contain finer groundmass then the diktytaxitic host rock, showing an inverse relationship to other ESRP tholeiites (Figure 4). Diktytaxitic segregation structures have been studied by others [9-11] yet many disagree on the mechanism for the actual initiation of growth and the resultant diktytaxitic texture. Distinct geochemical differences in the host rock and these segregation structures are being analyzed for major and trace elements. Quaking Aspen Butte samples contain finer groundmass, fewer (10%) phenocrysts, and a less well-developed diktytaxitic texture. It is clear from field study that both monogenetic shields are the product of a single event with little or no lapse in time between flank and summit emplacement. There is no evidence of a soil or a sediment horizon between the summit cap and flank flows.

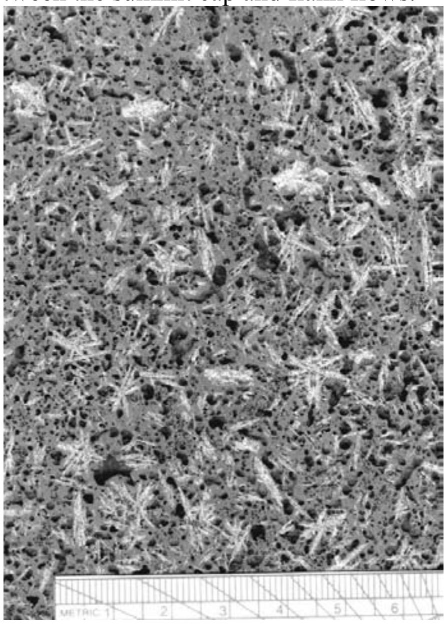


Figure 3: Table Legs Butte summit sample, clean diktytaxitic defined by plagioclase laths piercing vesicles.

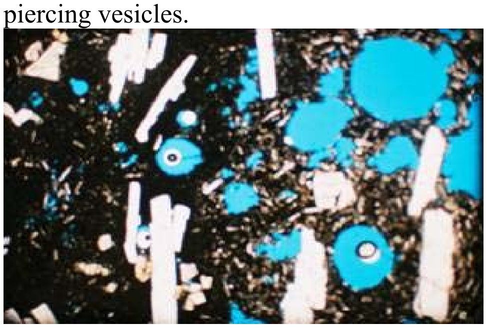

Figure 4: Segregation structure on the left with host rock on the right, power is 10X, field of view is 2.2mm

**Geochemical data:** Preliminary studies [3,8] suggest possibly more fractionated caps compared to shallower shield flanks. Analytical data from this study shows that flank and summit regions cannot be geochemically separated. Only trace elements of Table Legs Butte are available at this time; however, a plot of Th vs. Ba and an REE plot (Figures 5, 6) show no chemical differences in the summit and flank samples. Geochemical analysis will continue to confirm or deny this preliminary result. The distinct summit regions may be a function of different eruptive rate. Continued work to characterize the formation of coarsely dikty-taxitic textures, segregation structures, and the possibly high amount of sub-aerial crystal growth will improve the understanding of how volcanic processes affect shield morphology. Geochemical analyses of distal flow deposits, including major elements analyses and microprobe work of samples from Table Legs Butte and Quaking Aspen Butte will lead to a better understanding of magma genesis and the volcanic processes of small shields on the ESRP and on Mars.

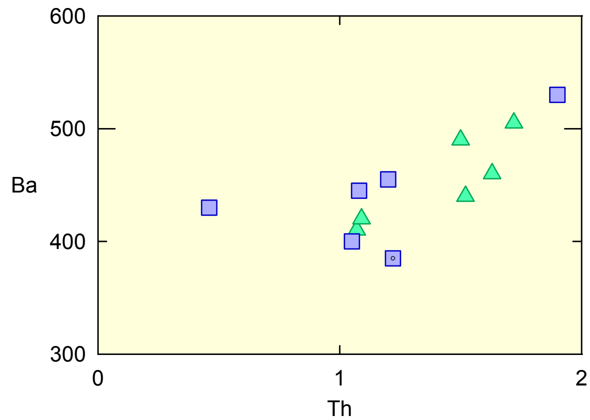


Figure 5: Table Legs Butte samples: summit samples are triangles and flank samples are squares (ppm).

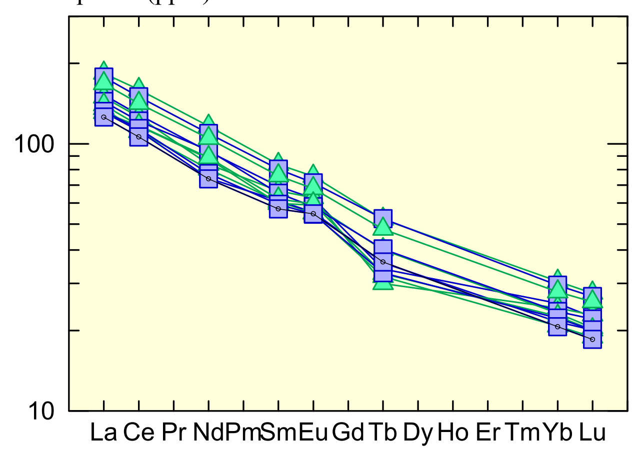


Figure 6: Chondrite-REE pattern, again summit samples are triangles and flanks are squares.

**References:** [1] M. P. Wong et al. (2001) *LPS XXXII*, #1563 [2] Greeley R. (1982) *JGR 87,* 2705-2712. [3] S. E. H. Sakimoto et al. (2003) *Sixth Int. Conf. Mar,* #3197. [4] Hodges C. A., Moore, H. J. (1992) *USGS Prof. Pap., 1534.* [5] K. Kallianpur, P.J. and Mouginis-Mark (2001) *LPS XXXII,* #1258. [6] S. E. H. Sakimoto et al. (2001) *LPSXXII,* #1808. [7] Kuntz, M. A. et al. (1992) *GSA Memoir 179,* 227-267. [8] S. S. Hughes et al. (2002) *GSA Sp. Pap. 353*, 151-173. [9] Rogen et al. (1996) *JVGR 74*, 89-99.[10] F. Goff, (1996) *JVGR 71*, 167-185.[11] Anderson et al. (1984) *J.Geol. 92*, 55-72.