Small Plains-style Shield Volcanoes on Mars and Earth
Studied in the Lab and in the Outdoor Classroom

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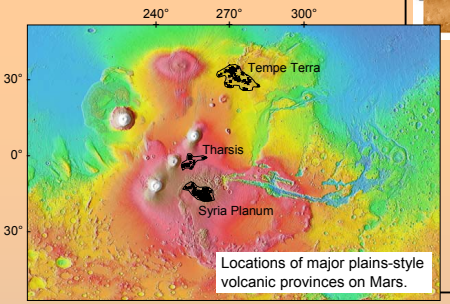
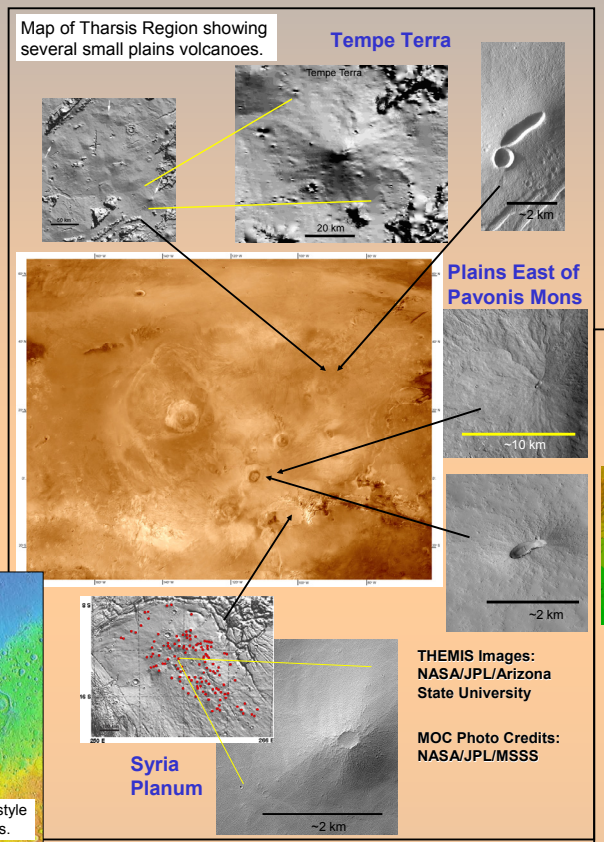
Objective: To evaluate the geologic settings, volcanic features, processes and possible compositional types associated with small plains-style shield volcanoes, and discover why they are different from other types of volcanoes on Earth and Mars.

Introduction: Small mafic shield volcanoes, abundant on the terrestrial planets, are the dominant landform in provinces characterized by plains-style volcanism [1]. Exemplified on Earth within both oceanic and continental settings (e.g., Hawaii, Snake River Plain), they provide analogs for similar systems on other planets, especially those of Tempe Terra, Syria Planum and Tharsis (near Pavonis Mons) regions of Mars. Topographic analysis [2, 3, 4] of individual Quaternary mafic shields on the eastern Snake River Plain (ESRP) of Idaho (the type area for plains-style volcanism [1]) demonstrates similarity in size, volume, and shape of these shields, as well as the vent spacing in the volcanic fields on both planets.

Geochemical and physical volcanology studies of the ESRP [5, 6, 7] show an emerging model of volcanic evolution that implies multiple small batches of magma derived from upper mantle sources.





Lab and Field Exercise

Part I – The Basics of Volcanology and Eruption Styles

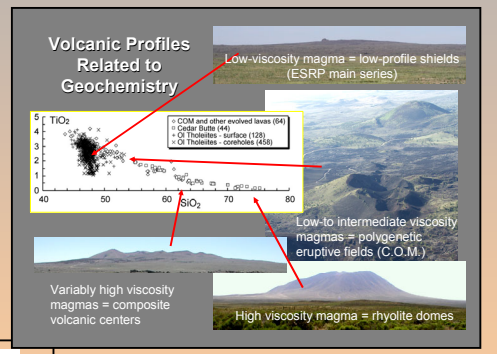
- Introduce volcanology and how it merges with other topics in geoscience – tectonics, geochemistry, geophysics, GIS and GPS, remote sensing.

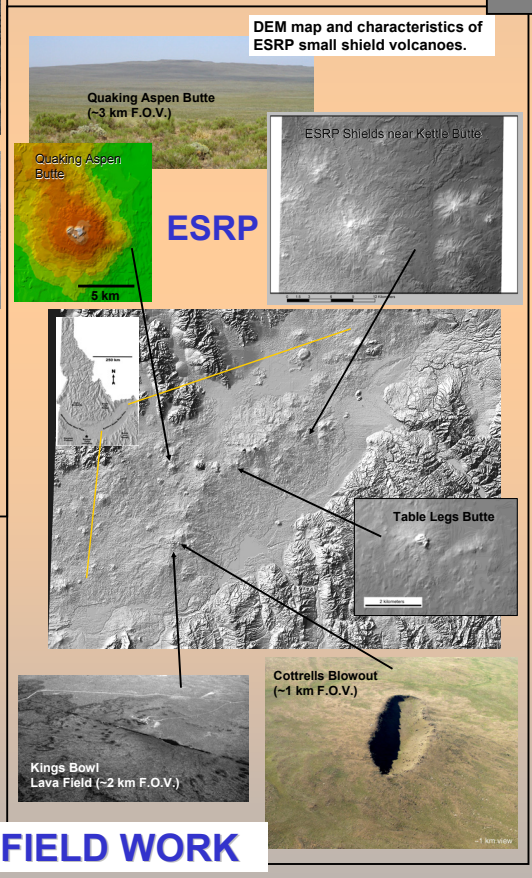
Part II – Plains Volcanism

- Provide example images of plains-style volcanoes on all terrestrial planets and the Moon, then focus on examples from Mars and the eastern Snake River Plain (ESRP).

Part III – Small Shields on Mars and Earth: Lab Analysis

- Students will select four volcanoes on Mars and four on the ESRP to explore and analyze using MOC and THEMIS images, MOLA data, USGS topo maps, DEMs, and photos.





Part IV – Field Trip to the Eastern Snake River Plain, Idaho: Field Analysis

- Using available maps and previous information, students will plan a field excursion to visit two of their selected volcanoes on the ESRP.

Study Three stages of eruption:

Fissure venting – gas-rich magma, elongate fissures, sheet flows begin to follow existing topography.

Shield building phase – slightly higher slopes relative to topography.

Final eruptive phase – degassed magma, summit region may have spatter ramparts with steep slopes, diminished rate of extrusion.

Part V – Final Report

Each student will write up a summary of interpretations, which will include comments on regional geologic setting, eruptive history, eruptive styles, variations in topography, and volume estimates if possible.

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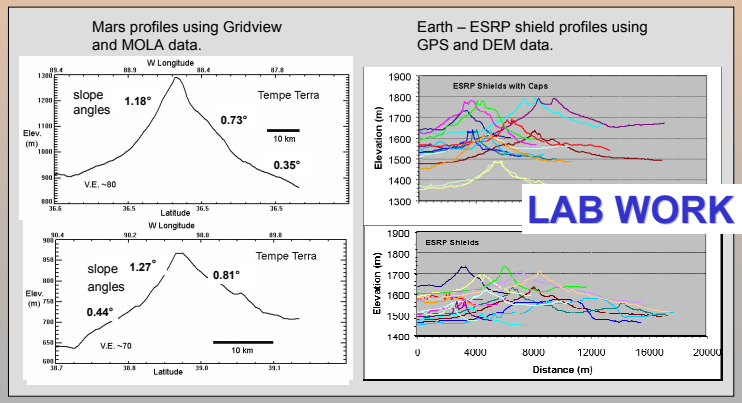
NOTE: Students first take a Knowledge Survey quiz (see handout).



Study in the lab and in the field.

A field trip can be planned for a day, a week, or longer….

References: [1] Greeley R. (1982) *JGR 87*, 2705-2712. [2] Sakimoto, S.E.H. et al. (2003) *6th Int. Mars Conf.*, #3197. [3] Sakimoto, S.E.H. et al. (2003) LPSC XXXIV, #1740. [4] Hughes, S.S. et al. (2004) LPSC XXXV, #2123. [5] Kuntz, M.A., et al. (1992) *GSA Memoir 179*, 227-267. [6] Hughes, S.S. et al. (2002) *Idaho Geol. Surv. Bull. 30*, 363-385. [7] Hughes S.S. et al. (2002) *GSA Sp. Pap. 353*, 151-173.