**VISIT NE SYRTIS MAJOR! WIN VALUABLE MARTIAN GEOLOGICAL HISTORY!** R. P. Harvey, Dept. of Geological Sciences, Case Western Reserve University, Cleveland OH 44106-7216 (rph@case.edu).

**Introduction:** Perhaps the most critical challenge facing ongoing studies of Mars is the absence of absolute ages to "nail down" the relative chronology established through crater-counting [e.g. 1]. With no sample return mission or *in situ* radiochronology device currently planned, the best alternative is to establish clear petrological links between specimens in hand (the Martian meteorites) and unique events in Martian history. The physical, geochemical and spectral properties of Syrtis Major show unique and compelling correspondence with the properties of the Nakhlite / Chassignite group of Martian meteorites, suggesting an origin in this volcanic complex [2]. Instrumentation aboard MSL is well suited to confirming this link, which would for the first time provide absolute ages for the terrain under exploration. As a result, assessments of current or past habitability are provided with crucial context that places them accurately in Martian history.

**The Syrtis Major / Nakhlite link:** At nearly ~1100 km across, Syrtis Major is the largest of several Hesperian shield volcanoes superimposed on the Southern Highlands of Mars. Syrtis Major does not exhibit the profile of a typical basaltic shield. Flank slopes are shallow; long, thin lava flows are prevalent, with some extending into nearby Nili Fossae, Antoniadi crater and the Isidis basin [3]. The combination of low slopes and long thin flows requires a very low viscosity magma, while evidence for thermal erosion and a significant gravity anomaly suggest ultramafic parental magmas [4]. Similarly, spectroscopy suggests lavas dominated by clinopyroxene with Fe-rich olivine [e.g. 5, 6].

Among the known Martian meteorites, a group made up of all the known Nakhlites and Chassignites show compelling correspondence with the observed mineralogy and the suggested history of the Syrtis Major region. The Nakhlites and Chassignites share common crystallization (about 1.3 ba) and ejection ages (about 11 ma) and are thus thought to be members of a single differentiated ultramafic series of flows ejected during a single impact event [7]. High-Ca pyroxene and high-Fe olivine are unique features of the Nakhlites and persuasively similar to the mineralogy of NE Syrtis Major. Likewise, Chassigny's mineralogy is compellingly similar to that linked to sites in adjacent Nili Fossae, where early olivine-rich, hot and very fluid lavas from Syrtis may have invasively penetrated that terrain. Although the presence of relatively Mg-rich olivine spectral signatures is not unique to this region, the presence of Mg- rich olivine adjacent to rocks rich in clinopyroxene and Fe-rich olivine is unique and compellingly suggests proposed link.

**Significance:** Linking the Nakhites with NE Syrtis Major places the Early Hesperian at 1.3 ba rather than 2.9 - 3.8 ba [1,2]. ME Syrtis Major shows significant fluvial channeling, consistent with 700 ma pervasive, low-level aqueous alteration seen in the [7] As a result, this "dated" terrain provides context for recent fluid activity, aiding efforts to gauge current and past habitability. Older Noachian highlands crust is also accessible, providing context for the transition between young "dry" and ancient “wet” conditions, another component of Martian history it is critical to study.

**References:** [1] Hartmann and Neukum, *Space Sci. Rev.* **96**, 165 (2001). [2] Harvey and Hamilton *LPSC.* **XXXVI**, abst 1019. (2005) [3] Hiesinger and Head *J. Geophys. Res.* **109**, E01004 (2004). [4] W.S.Kiefer, *EPSL* **222**, 349 (2004). [5] Mustard *et al.*, *Science* **307**, 1594-97 (2005). [6] T. M. Hoefen *et al.*, *Science* **302**, 627 (2003). [7] Trieman Chemie Erde 65, 203-270 (2005).

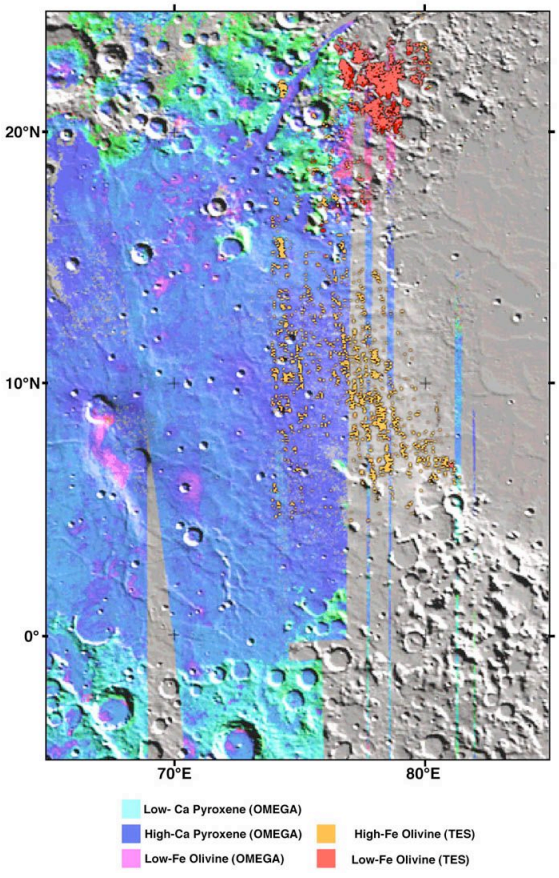


Figure 1. A) mineral compositions in Syrtis Major derived from TES and OMEGA data (after perspective image from MOLA data looking north over proposed source crater.