RHYTHMIC SEDIMENTARY ROCK OUTCROPS IN A CRATER IN WEST ARABIA, FOR THE 2009 MARS SCIENCE LABORATORY. E. Heydari[1], L. C. Kah[2], M. C. Malin[3], P. C. Thomas[4], [1]Department of Physics, Atmospheric Sciences, and General Science, Jackson State University, Jackson, MS 39217 USA, [2]Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, TN 37996, USA, [3]Malin Space Science Systems, PO Box 910148, San Diego, CA 92191-0148 USA, [4]Space Science Building, Cornell University, Ithaca, NY 14853 USA.

Introduction: To address the main objectives of the Mars Science Laboratory (MSL), including habitability and planetary protection, we suggest a landing site and traverse into an unnamed crater in West Arabia Terra at 8.9°N, 1.2°W that exhibits hundreds of meters of rhythmically-deposited, horizontally-layered rocks (Fig. 1).

West Arabia Crater: At least two rock units are exposed in a series of elongated hill-shaped outcrops (Fig. 1) that are similar in erosional expression to Cretaceous strata of central Texas. A layered rock unit occurs at the base of the section and is overlain by several hundred meters of strata consisting of 5–10 m-thick beds (Fig. 1). Landing immediately adjacent to these hills is not possible, but there are several places around the crater, including one to the northwest and another to southeast, that likely will meet EDL requirements (Fig. 1).

The Site and Science: The West Arabia Crater provides a remarkable opportunity to investigate Earth-like, rhythmically-layered strata. Similar rocks occur in other West Arabia craters that are less accessible to MSL (and also in southwestern Candor Chasma, another site that might challenge MSL's EDL system [1]). The setting of these strata at this locality indicates deposition within an enclosed basin. Potential Earth-like analogs include the Eocene Green River Basin in Utah, the Pennsylvanian Paradox Basin in Utah, and the Permian Delaware Basin in Texas and New Mexico. Several types of sedimentary rocks may be present, depending on climate history, water chemistry, source materials, and transport mechanisms. Due to the nature of such environments, the possibility of addressing MSL's habitability objective is very high.

EDL and Trafficability: We suggest two possible landing ellipses (Fig. 1), both at elevations near -1.2 km. Assessment of slopes and thermophysical properties, plus acquisition of additional MOC images, is underway. The surface in the suggested ellipses may be covered with a mantle of windblown silt- to fine-sand, and the regolith may be crusted–on the basis of Viking-era thermophysical studies [2].

Concluding Comments: The suggested area provides a remarkable opportunity to investigate strata whose rhythmic character and outcrop morphology are extremely similar to horizontal sedimentary layers in several areas on Earth. We anticipate the possibility of finding a variety of sedimentary rocks including shale, sandstone, and chemically-precipitated strata. The rhythmic nature of these layers indicate internal or external forcing factors that operated on Mars during the deposition of these strata which likely include a record of changes in climate, sediment types, and water composition.

References: [1] Malin, M. C., and K. S. Edgett (2000) Science, 290, 1927-1937. [2] Presley, M. A., and R. E., Arvidson (1988) Icarus, 75, 499-517.

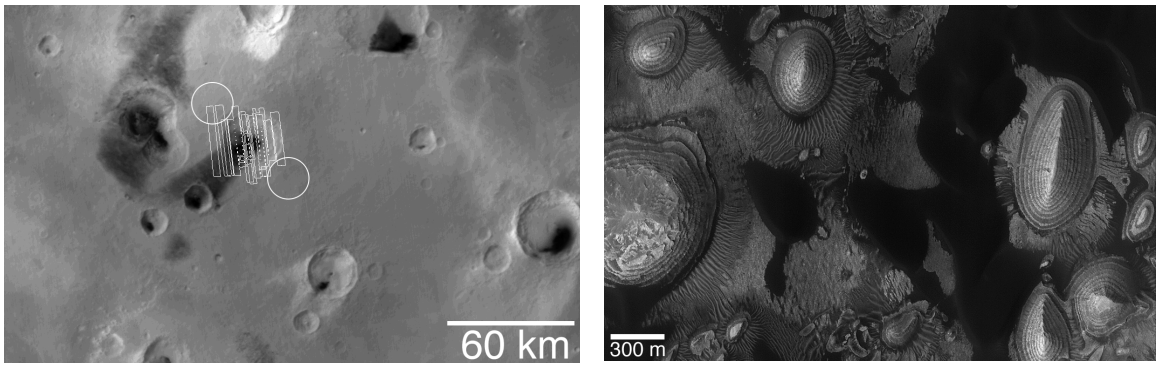

Figure 1. Left: Two possible 20 km diameter landing "ellipses" are shown to access hundreds of meters of stratified rocks within the West Arabia crater at 8.9°N, 1.2°W. The southeast "ellipse" is centered near 8.7°N, 0.9°W, and the northeast one near 9.3°N, 1.4°W. **Right:** Elongated hills consist of rhythmically-layered, horizontal strata (sub-frame of MOC image S07-00608).