

**Fluvial Deposits in Margaritifer Basin: Potential MSL Landing Sites.** K. K. Williams<sup>1</sup>, J. A. Grant<sup>1</sup>, and C. M. Fortezzo<sup>2</sup>, <sup>1</sup>Center for Earth and Planetary Studies, Smithsonian Institution, MRC 315, PO Box 37012, Washington, DC, 20013-7012; williamskk@si.edu, <sup>2</sup>Department of Geology, Northern Arizona University, Flagstaff, AZ, 86011.

**Introduction:** Margaritifer basin (centered near 337°E, 11°S within Margaritifer Terra) is part of the Uzboi-Holden-Ladon-Margaritifer (UHLM) mega-outflow system that runs from Argyre basin in the south to Ares Vallis to the north [1-4]. The proposed landing site (MB1 in Fig. 1) is located on a confluence plain within Margaritifer basin near the merger of Samara and Paraná-Loire valley systems with UHLM. Based on morphology and topography, it is likely that water ponded within Margaritifer basin and infiltrated into the subsurface [e.g., 4].

Fluvial activity had a major influence on the geomorphology within Margaritifer Terra, and widespread valley-forming activity extended into the middle to late Hesperian, coincident with widespread gradation in other areas [3-6]. Recent mapping [2,7] suggests the depositional confluence plain within Margaritifer may be as young as Amazonian in age. This implies the final stages of fluvial activity occurred later in Mars history than the more widespread activity that ended in the Hesperian. The complex fluvial history of Margaritifer basin and associated deposits make this site's biological potential an intriguing target for MSL.

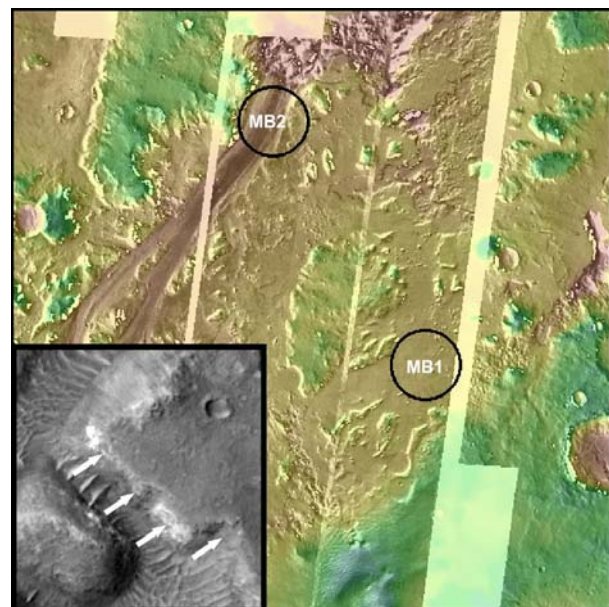
**Engineering considerations:** Site MB1 and an alternate MB2 meet the MSL engineering constraints (see table). Whereas MB1 is located along the edge of the basin, MB2 covers a likely erosional channel floor in the center of the basin and provides access to nearby scarps exposing depositional materials. Rock abundance is estimated to be less than ~14% for MB1, but the landing ellipse is small relative to the scale of the rock abundance pixels (Marsweb). THEMIS VIS data show that MB1 has relatively flat topography and a limited number of impact craters larger than 500 m diameter. Its rock abundance is likely less than 10%.

**Summary:** Sites MB1 and MB2 are safe from an engineering point of view and allow access to terrain where water ponded and infiltrated into the subsurface. Given this area's history of fluvial deposition, it should be a prime target for addressing the MSL mission goal of assessing the potential habitability of the landing site environment. Nearby MOC coverage shows possible layering in the near surface (Fig. 1 inset), however high resolution images of the landing area do not exist. Imaging by MOC, HiRISE, and other instruments would ascertain the nature and accessibility of layers that would record multiple episodes of deposition under former quiescent conditions. In addition, materials deposited in Margaritifer basin were

derived from the highlands along the UHLM, Samara, and Paraná-Loire systems. Accumulation of material from such a large area provides the possibility of sampling a wider range of compositions than may be available in other areas, benefiting the mission objective of characterizing the geology and geochemistry.

**References:** [1] Saunders, S.R. (1979) *USGS Map I-1144 (MC-19)*. [2] Grant, J.A. (1987) *NASA Tech. Memo. 89871*, 1. [3] Grant, J.A. (2000) *Geology*, 28, 223. [4] Grant, J.A. and T.J. Parker (2002) *JGR*, 107. [5] Grant, J.A. and P.H. Schultz (1990) *Icarus*, 84, 166. [6] Grant, J.A. and P.H. Schultz (1993) *JGR*, 98, 11,025. [7] Williams, K.K. and J.A. Grant (2006) *USGS 1:500K Map*, in review. [8] Smith, D.E. et al. (2001) *JGR*, 106, 23,689.

	MB1	MB2
Longitude (E)	338.1	337.3
Latitude	- 12.77	- 11.54
Elevation (m) [8]	- 2120	- 2535
TES TI	300-325	~350
Rock abundance	< 14%	~10%
Albedo	< 0.25	< 0.25
Slope @ 3-5 km	0.2° - 2°	0.5° - 2.5°



**Fig. 1.** Combined MOLA and THEMIS day IR showing proposed landing sites (20 km diameter ellipses). Arrows in inset show layering near the two sites (MOC image E04-00861. Box is 1.1 km across. NASA/JPL/MSSS).