**Geologic History Within Southeastern Margaritifer Terra, Mars** , C. M. Fortezzo[1], K. K. Williams[2], and J. A. Grant[3], [1]Department of Geology, Northern Arizona University, Flagstaff, AZ, 86011, [2]Department of Earth Sciences and Science Education, Buffalo State College, 1300 Elmwood Ave., Buffalo, NY 14222, [3]Center for Earth and Planetary Studies, Smithsonian Institution, Washington, DC, 20013.

**Introduction:** Southeastern Margaritifer Terra exhibits a multitude of fluvial features at various scales that reflect the rich history of water in this region of Mars [e.g. 1-6]. The major fluvial features in this area are the well-integrated valley systems Samara and Paraná-Loire Valles systems Continued geomorphic mapping in southeastern Margaritifer Terra is aimed at unraveling the complex relationships between valley formation and resurfacing events in seven 5°x5° quadrangles [9] (Fig. 1). Three western quads focus on the Himera, Samara, and Loire valley systems and their relationship with Jones crater. Four quads to the east cover valleys on the western flank of Newcomb crater and the proximal reaches of Paraná Valles. As with previous mapping, newer data sets (MOC, THEMIS, HiRISE, etc) reveal details not visible in Viking Orbiter data.

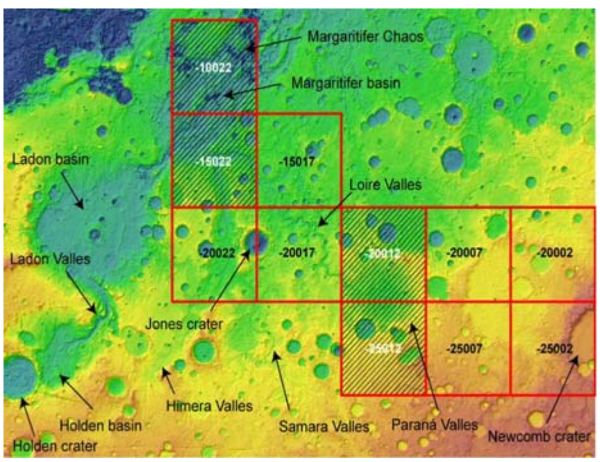


**Fig 1.** Mapping quadrangle locations (red boxes) in Margaritifer Terra. Shaded boxes are maps under review. Mapping discussed here is taking place in the other 7 quads. Background is MOLA 128 pixel/degree topography.

**Newcomb-Paraná Area:** This map area provides a good case study of geologic history in the Martian highlands. The area includes Noachian highland materials, large ancient impact basins, dense fluvial dissection and deposition, and impact gardening. The general trend of the topography is higher in the south-southeast and decreasing towards the north-northwest.

The center of the mapping area is dominated by a ~350 km wide central basin of a ~800 km diameter ancient multi-ringed impact crater [10]. The interior of the basin is basically horizontal (slope <0.01); the outlet is only ~200 meters lower than the main input. The rim of this crater is highly degraded on its northern, eastern and southern flanks with multiple breaches and impact overprinting (Fig. 2). Near the southern rim, the basin floor contains multiple lobate, low-relief flow deposits at the distal reaches of valley systems. These deposits have a smoother appearance in THEMIS daytime infrared images than the deposits in the central portion of the basin. The eastern crater floor is dissected by valleys originating from the high topography created by the Newcomb crater rim. These valleys dissect the high standing rim material from Newcomb crater and a lower elevation, ~30 - ~60 km wide ledge before fading into the basin floor. The northern portion of the rim is characterized more by impact overprinting than the small area of valleys flowing into the crater (Fig. 2). The western portion of the rim is degraded but not to the same degree. As with the northern portion, the western portion has a small number of valleys flowing into the basin. Both the western and northern outer slopes are heavily dissected and the only outlet from the basin is in the northwest. The relative paucity of channels inflowing from the north is likely due to the general topographic trend of decreasing elevation to the north-northwest portions of the mapping area.

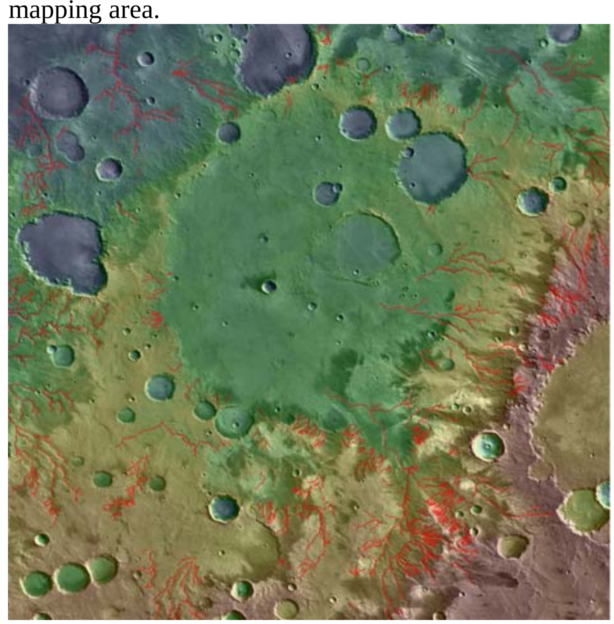

**Fig 2.** Newcomb-Paraná mapping area from 17.5 to 27.5 south, 350 to 360 east. Red lines indicate locations of valleys in the area. Centered on ~350 km diameter impact basin. Newcomb crater is located on the eastern margin. MOLA topography (red = high, blue = low) overlain on MDIM 2.1.

The central portion of the basin is characterized by long, narrow ridges, islands of chaotic terrain, friable materials, aeolian deposits and differences in THEMIS temperature brightness.

The long narrow ridges (Fig. 3) are a located at the western edges of a series of lobate features which are at increasingly higher elevations to the east-southeast. These features, while similar in age, may represent the maximum levels of materials settling out of fluid surges into the basin. One relatively fresh impact crater (Fig. 3) shows layering within the crater walls (Fig. 4). Three-band (8-7-5, 9-6-4 and 6-4-2) decorrelation stretches of THEMIS daytime infrared images suggest that materials in the basin are covered in a basaltic dust while the crater and its ejecta are a mélange of materials.

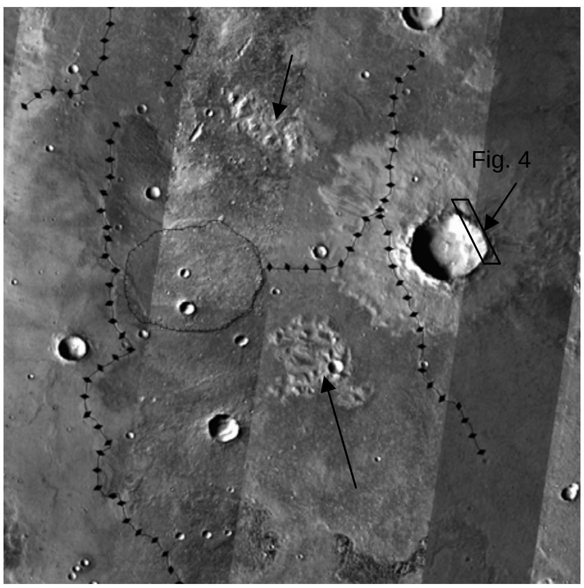


**Fig 3.** THEMIS daytime IR 100 m/pix mosaic of interior of the central basin. Diamond lines indicate the long narrow ridges associated with the lobate features. The arrows are pointing to the areas of chaotic terrain. The hashed line shows a buried circular shape thought to be a crater. Box indicates the location of Figure 4.

Several areas of positive relief chaotic terrain similar to that of Erythraeum Chaos in the basin west of Paraná Valles [1-5] are characterized by small dome-like features with cross-cutting linear features interpreted as dikes. The areas between domes are typically depressions filled with younger linear aeolian features that are typical of the surrounding basin floor. These are interpreted as more friable materials that are not as strongly welded by the preserved dikes of the dome features. The chaotic material is interpreted as forming from the release or movement of groundwater, which creates excess pore space, thus causing collapse.

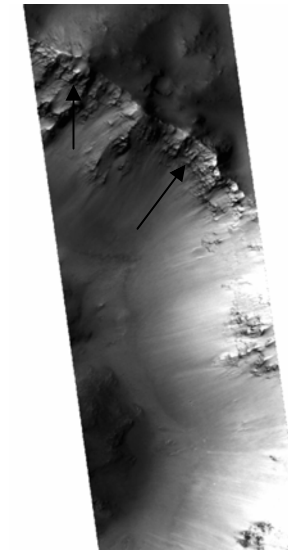

**Fig 4.** MOC image showing layered materials in the wall of a fresh crater within the basin interior. Eight distinct layers can be counted from this image and may indicate episodic deposition associated with surges in water from the surrounding valley networks. Portion of MOC image M0203917.

**Discussion:** The paucity of geomorphic evidence for fluvial erosion in the basin despite multiple inlets and a single outlet leads to the hypotheses that this was an extensive area of fluid ponding and/or infiltration into and subsequent transport through the Martian regolith. This infiltration is further supported by the presence of chaotic terrains tens to hundreds of kilometers from the distal reaches of any valley morphology. The ponding maybe supported by the presence of multiple lobes of deposition with the terminal ridge also tens to hundreds of kilometers from the distal reaches of the valleys. The layering within the crater indicates that there were episodes of deposition during the basins history. If these depositional lobes are due to episodic surges, what is the trigger for theses surges? Possibly seismic activity associated with impacts or volcanism. Further study is needed.

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**References:** [1] Saunders S. R. (1979) *USGS I-1144*, USGS. [2] Baker V. R. (1982) *The Channels of Mars*, U of TX Press, Austin. [3] Parker T. J. (1985) Masters Thesis, CA State Univ., L.A. [4] Parker T. J. (1994) Ph.D. Thesis, USC, L.A. [5] Grant J. A. (2000) *Geology, 28*, 223. [6] Grant J. A. and T. J. Parker (2002) *JGR*, *107*(E9), 5066. [7] Williams K. K. et al. (2005) *LPS XXXVI*, Abstract #1439. [8] Williams K. K. and J. A. Grant (2007) submitted map, USGS. [9] Fortezzo C. M. et al. (2006) *Planetary Geologic Mappers Meeting*, Nampa, ID. [10] Schultz, P. H. (1982) *J. Geophys. Res.*, 87, 9803.