BARSUKOV CRATER AND ITS RIM-BREACH CHANNEL, SILINKA VALLIS (MARS). Neil Coleman, Univ. of Pittsburgh at Johnstown (Dept. of Energy & Earth Resources, Johnstown, PA 15904; ncoleman@pitt.edu).

Introduction: Craters on Mars include spectacular examples of breached craters. Some, like Gusev Crater, were formed when surface flows overtopped and breached the rim, forming a crater lake. In other cases groundwater erupted from below the floors and filled the craters to overtopping, leading to floods that drained the enclosed lakes. Examples include Aram Chaos, Barsukov and Galilaei Craters (Fig. 1) [1], and Morella Crater [2] near Ganges Chasma. The overtopping of Morella and Galilaei Craters caused catastrophic "dam breach" flooding that incised Elaver and Tana Valles, respectively. Here I examine Barsukov Crater and its outlet channel, Silinka Vallis (Fig. 1).

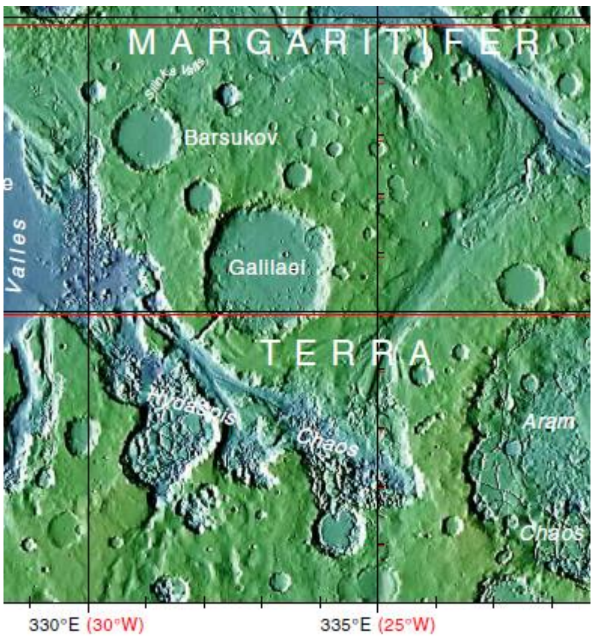

Figure 1. Location of 67-km wide Barsukov Crater (8°N, 331°E) and Silinka Vallis (upper left). Tiu Valles is on left margin; Ares Vallis at upper right.

Discussion: Barsukov Crater has multiple breaches, the easternmost being the source of Silinka Vallis (Fig. 2). Based on MOLA elevation data, the two breaches west of Silinka V. were eroded by flows *into* Barsukov from the northwest. Early overland flows from Tiu Valles or Hydaspis Chaos eroded the terrain along the NW rim of Barsukov. The base level of this eroded surface stands at -2440 m, >500 m higher than the floor of Barsukov (Fig. 3, top). Silinka V. formed later when lake water overtopped the rim of Barsukov. The vallis eroded to a base level < -2880 m, almost as deep as the crater (Fig. 3). The drainable paleolake volume between -2440 m and -2900 m is 1310 km^3.

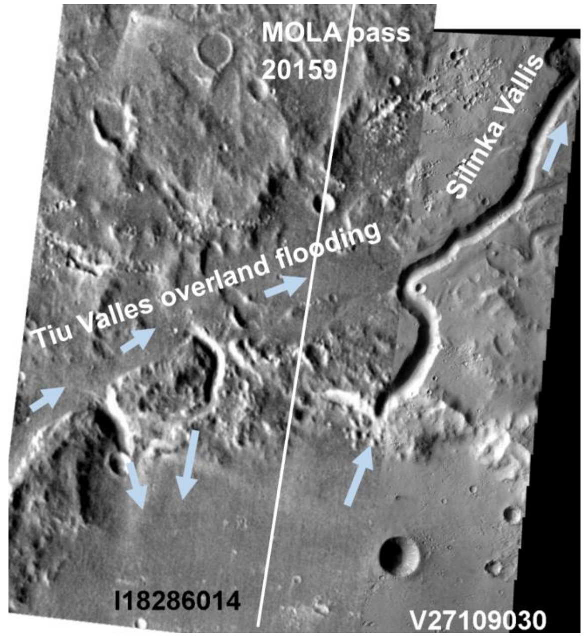

Figure 2. Three breaches in northern rim of Barsukov Crater. Blue arrows show flow directions. Crater at lower right is 3.5 km wide (8.3N, 331.1E).

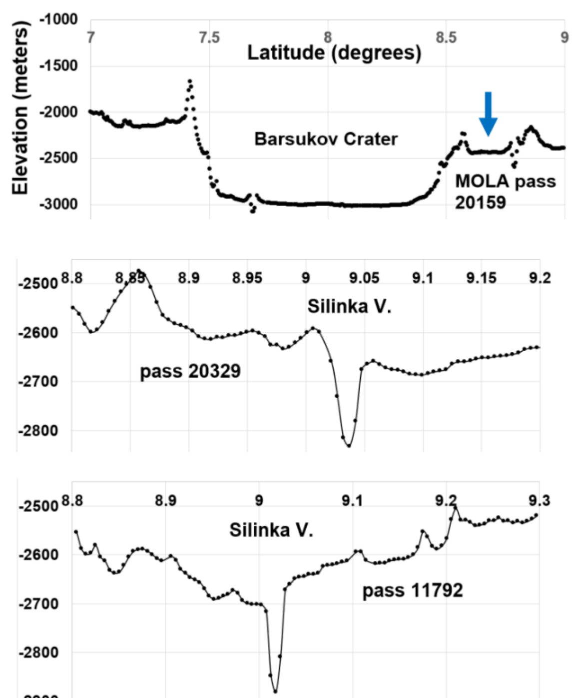

Figure 3. MOLA passes showing Barsukov floor elevation (-3 km) vs. incision depths of Silinka V. Blue arrow shows surface eroded by Tiu V. flooding. Surface trace of pass 20159 is plotted in Fig. 2.

Detailed views of Silinka Vallis are shown in Figs. 4 to 6. The vallis floor is variable due to surface processes over eons, but over its length the mean energy slope is away from Barsukov Crater and toward Ares Vallis. Silinka Vallis is 127 km long and 1.9 km wide at the crossing of MOLA pass 11050. The length to width ratio is ~67, similar to older valley networks in the southern highlands. The large length to width ratio, small mean energy slope (0.0028), and sinuosity index of 1.2 for Silinka Vallis show that it probably formed gradually, and not by catastrophic rim breach and flooding in the manner of the crater breaches at Morella Crater/Elaver V. [2] and Galilaei Crater/Tana V.

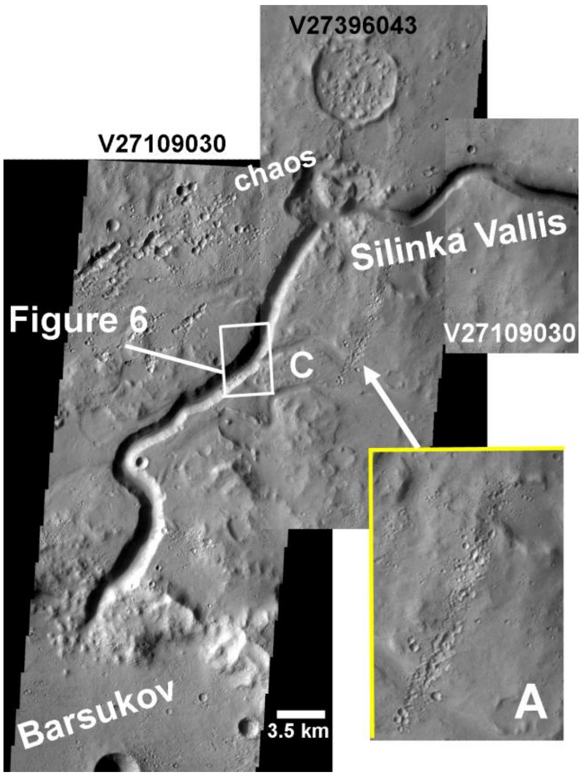

Figure 4. Silinka V. in mosaic of THEMIS images [3]. Chaos near top formed along the vallis course, probably triggered by channel incision of the cryosphere. Two small channels at "C" were eroded by early overland flow. Chaos-filled crater at top may have held a paleolake that drained southward to the chaos. Fault-aligned strings of "pseudo-craters" at upper left and inset "A" are likely cavi produced by graben collapse or the loss of subsurface volatiles.

Conclusion: Evolution of the long, narrow, sinuous, gently sloping Silinka Vallis would have been governed more by conventional stream flow, erosion, and transport processes, and less by dramatic crater lake "dam breach" scenarios. It is also possible that secondary sources added to the flow, such as groundwater released from the chaos near the top of Fig. 4.

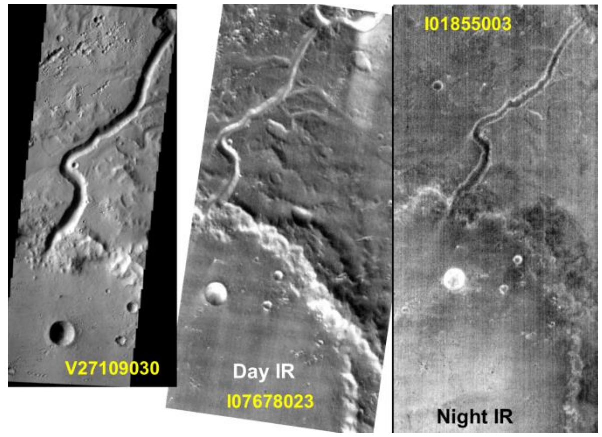

Figure 5. THEMIS visible light, day IR, and night IR images [3]. Brighter areas in the right panel are dominated by rocky surfaces, which include the upper margins of Silinka Vallis, the interior of Barsukov Crater, and the bright crater on its floor.

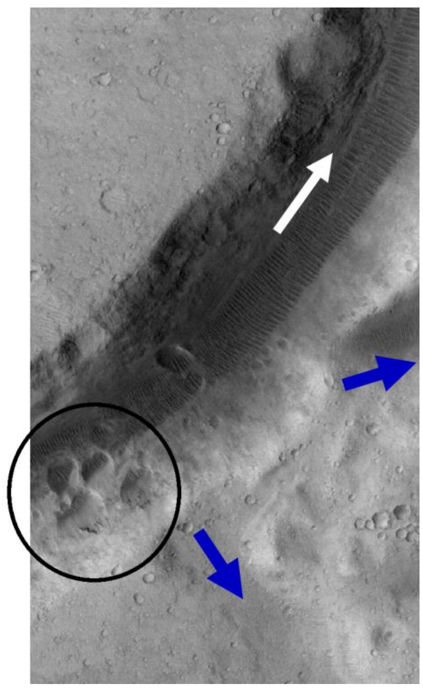

Figure 6. MOC image S0500683 [4] (MOC camera 2-5 m/pixel). White arrow is flow direction in Silinka Vallis. Blue arrows show flow directions in scabland channels formed at outset of Silinka flooding. These channels are now hanging valleys. Circle encloses features that are likely depressions formed by loss of frozen volatiles.

References: [1] Coleman N. (2014) *LPS XXXXV*, Abstract #1293. [2] Coleman N. (2013) *JGR*, 118, 263–277, doi:10.1029/2012JE004193. [3] Christensen et al., *THEMIS public releases*, http://THEMIS-data.asu.edu/. [4] Malin Space Sci. Sys. (2014) at http://www.msss.com/moc_gallery/.