SINUOUS RIDGES IN PETA CRATER, MARS. T. J. Parker, Jet Propulsion Laboratory, California Institute of Technology, Pasadena (timothy.j.parker@jpl.nasa.

Introduction: Peta Crater (21°S,351°E) contains a system of sinuous ridges similar to, but smaller than, the well-known Dorsa Argyre and Dorsa Argentea ridges. Recent CTX and HiRISE images of the Peta crater ridges is enabling a detailed examination of this confined system of ridges.

Eskers? Or something else? The Dorsa Argyre and Argentea systems are most often interpreted as eskers, including recently [1], though the distribution and topography of the Argyre ridges would seem to suggest an equipotential surface, and a process of concentrating most of them along the southeast interior of the basin [e.g., 2]. Both interpretations involve fluvial sediment sources, but [1] infers a glacial/periglacial setting within Argyre, whereas [2] suggested a lake or sea within the basin.

Sinuous ridges of this type are found at all latitudes on Mars, exclusively in topographic bains, and most often within impact basins and other large craters. Several can be seen along the eastern interior of Schiaparelli Basin, at equatorial latitudes. Polar settings are therefore not a requirement for this type of ridge to form.

The majority of the Dorsa Argyre ridges can be traced back to the now-buried mouth of Surius Vallis, (at 57°S, 314°E). Sources for the Dorsa Argentea and Schiaparelli ridges are either obscured or are otherwise not similarly obvious.

The ridges in Peta crater are interesting in that they appear not to have any possible fluvial source channel, so their origin must be explained by other means.

Push moraines or push "beach ridges"? High resolution orbiter images of Dorsa Argyre confirm the Viking-based interpretation of [3], that found the ridges to be layered contiguous with the surrounding deflated plains, limiting the possible range of interpretations to the sedimentary hypotheses of [1,2]. Mars is certainly cold, and may have been at the time these ridges formed (early Hesperian), so it's logical to infer periglacial features such as eskers. But the consistent summit elevation for the larger ridges, and their concentration around the southeast margin of Argyre might argue for a lake. In this paper, I will use the Peta crater ridges and associated morphologies evident at CTX and HiRISE scales, to combine the two interpretations and suggest a different landform requiring both a lake and an ice-cover.

Bear with me a moment: In this model, large topographic basins like Peta crater are lake sites. Many, such as Argyre, are fed by channels cutting their rims and draining into them. Others may lie below the local water table, thus not requiring fluvial input -perhaps Peta crater is one of these. These lakes would be ice-covered much of the time. Channel-fed ridge systems would be active seasonally, and parts of the lake would be ice-free, perhaps directing fluvial activity into these areas. During these relatively-warm seasons, the ice cover would not be frozen fast and would move around with the prevailing wind, pushing and piling up sediment preferentially in the downwind direction. In Peta crater, where there is no fluvial sediment source, perhaps the ridges represent a combination of push moraines and barrier ridges that form and are modified as the ice cover freezes to the shore in colder months, then melts and moves around with changing winds in warmer months.

HiRISE has recently acquired stereo images of the sinuous ridges in Peta crater. I will attempt to show how these data support the notion that there was once an ice-covered lake within Peta crater, and that the sinuous ridges around the crater formed as this ice cover moved around, shoving sediment ahead of it (periferal to it) and forming the ridges.

[1] Banks M. E. et al. (2009) *JGR*, *114*, 19p. Author A. B. and Author C. D. (1997) *JGR, 90,* 1151–1154. [2] Parker T. J. et al. (1986) *NASA TM 88383*, 468-470. [3] Parker T. J. (1994) PhD, Univ. So. Cal. Ch 3, 59-83.

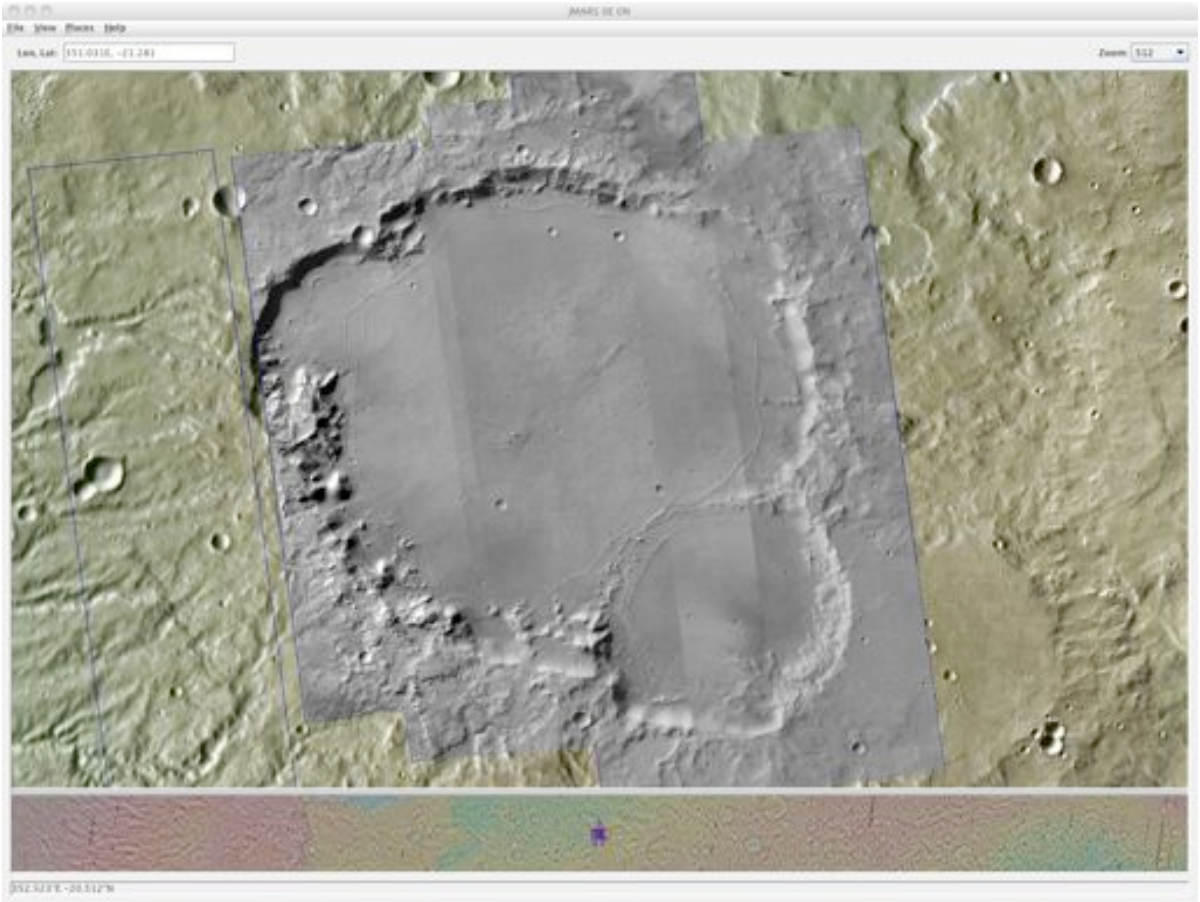

Figure 1: Sinuous ridges around interior margin of Peta Crater and neighboring crater to southeast. Note that all valley networks around the crater drain away from the rim. No valleys cut the rim and drain into the crater.