



Stratigraphic evidence of past fluvial activity in southern Melas Chasma, Valles Marineris, Mars

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During the late Noachian and early Hesperian periods, listric faulting led to the development of a series of hanging depressions throughout the Valles Marineris canyon system [1]. One such depression, situated on the southern wall of Melas Chasma, forms an enclosed basin which has since undergone modification from the late Hesperian to Amazonian. There is a multitude of evidence suggesting that the basin (hereon referred to as the Southern Melas Chasma Basin; SMCB) was once host to active fluvial processes, that at minimum lasted for several hundred years [2,3]. Central to this is what appears to be the remains of a palaeolake, which is approximately 80 by 40 kilometres in area. The palaeolake contains a complex sequence of sedimentary stratigraphy, which includes several structures that resemble deltas and/or submarine fans on both the east and west side of the basin [4], and appear to originate from a network of channels and valleys that terminate in the basin. Previous studies have shown that the western valley network has drainage densities similar to terrestrial values and a dendritic nature that is indicative of precipitation and surface runoff [3]. Higher resolution mapping of the SMCB is important to further understand the stratigraphic succession and geomorphology, and to quantify how long liquid water may have been present within the basin. For this study, new digital elevation models (DEMs) have been produced in SOCET SET using stereo images from the Context Camera (CTX) and the High Resolution Imaging Science Experiment (HiRISE), both aboard the Mars Reconnaissance Orbiter. The DEMs have been produced at ~6 and ~1 m/pixel vertical resolution for CTX and HiRISE respectively. There is approximately 150-200 m of sediment within the stratigraphic succession; some individual strata are less than 10 m thick. The delta/fan structures appear to occur at different stratigraphic positions low down within the sequence. Cliniform-like and cross-bedded structures are shown to occur near the top of the sequence (a contrast to the laterally expansive, planar beds below), which suggest a significant change in depositional conditions within the SMCB during the time liquid water was stable.

References:

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