Dromart et al. (2007) describe a spectacular stratigraphic complex within southern Melas Chasma, Valles Marineris, Mars. Following a rigorous stratigraphic description of the complex, they proceed to interpret the responsible depositional processes as analogous to subaqueous channel-levee processes on Earth. The observed stratigraphy, however, can be explained as large-scale cross-beding typical of eolian bed forms.

Large-scale cross-bedding in the Jurassic Navajo Sandstone of the Colorado Plateau region, United States (Rubin, 1987), has also been the subject of debate regarding its subaerial versus subaqueous origin (Picard, 1977, and subsequent discussions). Traditionally interpreted as eolian, a subaqueous tidal bedform interpretation for cross-bedding in the Navajo Sandstone was suggested (Freeman and Visher, 1975) based partly on the discovery via seismic sounding of large-scale tidal bedforms in estuaries and in the North Sea (Houbolt, 1968). However, these large subaqueous bedforms did not have angle-of-repose cross-bedding, although in vertically exaggerated images, they appeared as dunes. In addition, Freeman and Visher (1975) invoked deformed bedding in the Navajo Sandstone as indicative of a subaqueous origin (Picard, 1977, and subsequent discussions). Traditionally interpreted as eolian, a subaqueous tidal bedform interpretation for cross-bedding in the Navajo Sandstone was suggested (Rubin, 1987; Rubin and Carter, 2005) of a deposit caused by spurs oscillating back and forth but with a net migration direction, normal to a migrating bedform, and produced a similar morphology (Fig. 1). While we do not claim this result as being the correct one, we feel it is sufficiently compelling to stress the importance of not dismissing the eolian bedform hypothesis prematurely.

Another important point to address is the relationship of the stratigraphic complex with the history of Valles Marineris. Dromart et al. suggest that the subaqueous environment occurred following the formation of Valles Marineris under a thick ice sheet (Dromart et al., 2007, p. 365), thus allowing significant water discharge to form the complex fairly recently in Martian history. We find little evidence to support the ice-sheet claim.

In contrast, a more likely hypothesis is that the complex was deposited prior to the opening of Valles Marineris, and was exposed during formation of the canyon. Indeed, other layered outcrops in and around Valles Marineris have been studied by different workers and found to have been exhumed, rather than deposited (Catling et al., 2006; Malin and Edgett, 2000; Montgomery and Gillespie, 2005). In this interpretation, the stratigraphic sequence is evidence that the early periods of sedimentation (whether aqueous or eolian) on Mars are now buried under several kilometers of volcanic rock at the Tharsis locale (Clifford and Parker, 2001), except where exhumed by the formation of Valles Marineris.

REFERENCES CITED


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The right. Top right: Dromart et al.’s Figure 3a. The dotted lines represent the location of the unconformable contact mapped by Dromart et al. (2007).