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Interior layered deposits in Valles Marineris, Mars: Insights from 3D-data obtained by the High Resolution Stereo Camera (HRSC) on Mars Express

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The Interior Layered Deposits (ILD) in the Valles Marineris depressions on Mars may be of volcanic or sedimentary origin. Either way, their presence has profound implications for the formation of the Valles Marineris itself. The High Resolution Stereo Camera (HRSC) on board the Mars Express mission obtains high-resolution stereo and multipectral images, which are particularly well suited for the geomorphologic analysis of the ILD. One possible key to decide whether the layers are volcanic or sedimentary is their layering geometry, i.e., their strike and dip. At first order, sedimentary, water-lain deposits should have a horizontal layering. On the other hand, volcanic layers from pyroclastic eruptions, including subglacial eruptions, might be inclined, e.g., as a part of tuff cones or in subglacial volcanoes. The strike and dip of layers should then display a concentric pattern around the vent. Digital Elevation Models and orthoimages derived from HRSC data have been used to measure the strike and dip of several ILD in the troughs of Hebes, Ophir, Candor, Melas, and Juventae Chasmata. In most cases, the layers have dips of 10°-20°, dipping outward from the centers of the ILD. This pattern would be in agreement with a volcanic origin. At Juventae Chasma, the layering of one ILD at -4.5°, 297.3°E is subhorizontal. This particular ILD is also distinguished from the other ILD covered by this study by its morphology, as revealed by HRSC, Themis, and MOC images, and by its mineralogy, as revealed

by the imaging spectrometer Omega on Mars Express [Gendrin et al., 2005]. Here, a sedimentary origin would be consistent with our measurements.