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Kame-like structures observed in Ares Vallis, Mars.

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Ares Vallis is one of the greatest outflow channels of Mars: originates in Iani Chaos, extends for about 1500 km, and debouchs onto Chryse Planitia. Several geologic histories have been proposed for the evolution of this channel. Erosion by cataclysmic floods and glaciers account for many of the observed morphologies, such as streamlined uplands and grooved terrains.

We investigate the downstream reach of Ares Vallis (about 14˚N and 28˚W) that is characterized by an unusual mesas-like landscape. To this purpose we utilize several datasets, including new High Resolution Stereo Camera (HRSC) data, with a resolution up to 12.5 meters/pixel. The large footprint and high resolution of HRSC images are ideal to observe stratigraphic relationships and wide-ranging small-scale morphologies. Furthermore stereo capability of HRSC data allow us to perform three-dimensional analysis of structures.

Mesas-like features appear as flat-topped mounds rising for about 100 m to 500 m, varying in shape, dimension or orientation. Stratifications could occur both on topmost part of mesas and along their slopes. Some mesas show a stratified structure along one slope, while on other slopes the stratifications could be very faint, or unrecognizable. Furthermore, neighboring mesas can show different layerings. These and other observed characteristics are similar to those of terrestrial kame features. Terrestrial kames are ice-contact deposits that form in the presence of stagnant dead-ice bodies. Once ice is melted away, kame features rise as flat-topped, steep-sided, variously-shaped mounds. Differences in layering and altitudes of nearby mesas-like features lead us to discard their origin due to erosive processes.

Stratigraphical relationships among mesas and others morphologies are investigated taking advantage of three-dimensional visualization: the visualization is conducted by draping MOC Na, THEMIS and HRSC images on HRSC stereo-derived DTMs. In our observations mesas appear to overlap and postdate both grooved terrains and some streamlined uplands. This implies that: i) downstream reach of Ares Vallis was filled with dead-ice mass(es); ii) part of grooved terrains and streamlined uplands of the downstream reach of Ares Vallis was buried by ice.