DETAILED OBSERVATION OF AN ILD WITHIN SOUTHERN COPRATES CHASMA, VALLES MARINERIS, MARS. F. Fueten[1], Y. Abdulla[1], R. Stesky[2], P. MacKinnon[1], E. Hauber[3], T. Zegers[4,] and K. Gwinner[3], [1]Department of Earth Sciences, Brock University, St. Catharines, Ontario, Canada L2S 3A1 < ffueten@brocku.ca>; [2]Pangaea Scientific, Brockville, Ontario, Canada; [3]Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany; [4]Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands.

Introduction: Interior layered deposits (ILDs) occur throughout the chasms of the Valles Marineris [1]. Multiple hypotheses for their origin and mechanism of formation have been proposed [2, and later references within 3]. Most workers suggest that they are younger than the present troughs that they are found in though it has been argued that they could be older exhumed deposits [4,5].

The chasmata of Valles Marineris were likely formed during a two stage process [1,6]. Ancestral basins with irregular outlines were proposed to form prior to the opening of the Valles Marineris during rift-like faulting [1]. Faulting during the opening of the Valles Marineris connected surrounding basins forming the current canyon configuration [6]. A recent model for ILD formation, based on stratigraphic and structural observations [3] within western Candor Chasma suggests that deposition occurred synchronously with subsidence of early basins and that individually subsiding basin blocks may be identified. A major period of erosion followed that is most likely associated with the linkage of basins and the establishment of drainage channels during the opening of Valles Marineris. Following that period of erosion there is only evidence for minor subsequent deposition.

Method: Primary data are High Resolution Stereo Camera (HRSC) panchromatic orthoimages, obtained during orbit 1995 (12.5 meters per pixel) and corresponding DEM (50m grid spacing). The Context Camera image (CTX) was registered to the HRSC data and layering attitudes were measured using the software package Orion [3]. Layer attitude measurements from HRSC and CTX images compare well. A HiRISE (High Resolution Imaging Science Experiment) image was also used for observations and registered to the DEM but not used for layer measurements.

Observations: The ILD is located on the southern edge of Coprates Canyon (Fig 1A) at the lower termination of two wall rock embayments, approximately 15km from the edge of the plateau (Fig 1C). The ILD consists of two lobes (Fig 1B), the top elevation of the eastern one (~ -100m) is approximately 3800m below the local plateau level of ~3700m. Total exposed thickness along the western lobe is ~700m and ~ 500m along the eastern lobe. The deposit throughout the structure appears to be a finely layered [4] material. No significant variations in grain/clast size or composition can be detected throughout the deposit. Layers at the lowest stratigraphic levels (yellow arrows Fig 1B, D) dip 12°-18° to the northeast. Layers at higher stratigraphic levels dip 7°-12° to the north. Layering between the lobes becomes progressively shallower, with dip direction rotating from the NE towards a more northerly attitude, going up the section. While some of the layers at the upper stratigraphic levels can be traced across both lobes, there is also evidence that layers from the thicker western lobe thin out and may not continue on the eastern lobe (Fig 1E).

Discussion: The observations are consistent with lower layers covering a basement topography of the sloped portion of the lower canyon wall. In particular the westerly dip of the lower layers (yellow arrows) corresponds well to the expected dip of basement (Fig 1D). As more material is deposited, preferentially filling in the basement lows, attitudes can be expected to become shallower; this is observed at higher stratigraphic levels.

The most likely source regions for the deposited material are the two wall rock embayments. The location and extent of this deposit is consistent with erosion from the local embayments and deposition below. In particular the lack of ILD beyond the eastern and western wall rock promontories (Fig 1C, 1D) argues against this deposit being part of a more regionally extensive deposition system. Thinning out of layers may suggest influx from either of the two source regions at any time or influx of limited material that did not cover both lobes.

Conclusion: This ILD postdates the formation of Valles Marineris as well as the formation of these wall rock embayments. The ILD is of sedimentary origin, with the most likely source of sediments being locally derived from the two embayments.

References: [1] Lucchitta, B.K., et al. (1994), *J. Geophy. Res., 99*, 3783-3798. [2] Lucchitta, B. K., et al. (1992) in: Mars (A93-27852 09-91), p. 453-492. [3] Fueten, F., et al. (2008), *J. Geophys. Res., 113*, E10008, doi:10.1029/2007JE003053. [4] Catling, D.C., et al. (2006) *Icarus, 181*, 26-51. [5] Malin, M.C., and K.S. Edgett (2000), *Science, 290*, 927-1938. [6] Schultz, R.A. (1998*), Planet. Space Sci*., 46, 827-834.

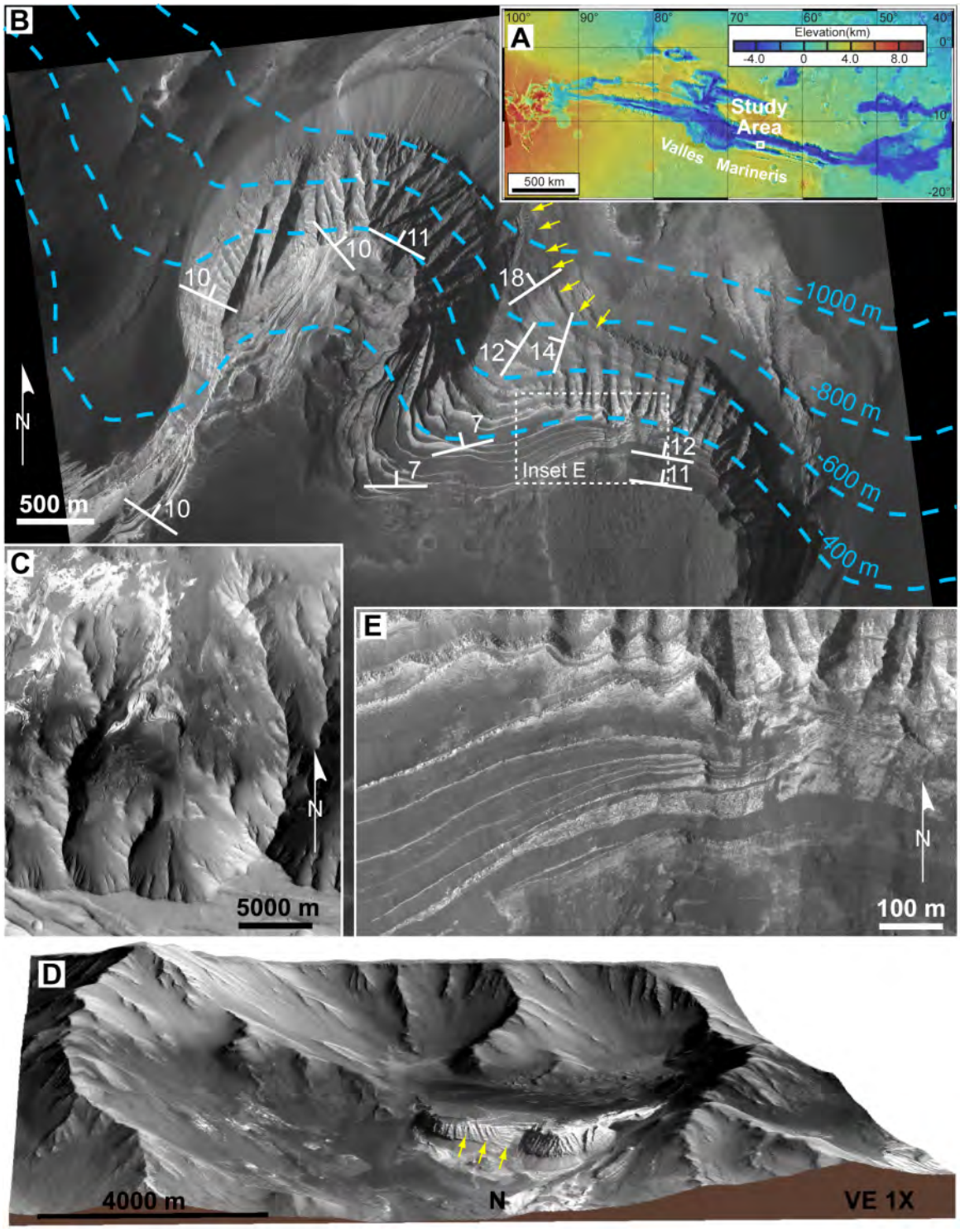

Figure 1. A) Location of study area. B) HiRISE image (PSP_002722 _1665_RED) of ILD with elevation contours and attitude measurements. Attitudes measured in CTX and HRSC images. C) CTX image (P06_003355_1673_XI_12S064W) of region with two wall rock embyments to the south of the ILD. D) 3D view of region, CTX image over HRSC DTM. Yellow arrows correspond to basal ILD layer, also outlined with yellow arrows in 1B. E) HiRISE closeup of layer detail indicating possible merging of layers. Location of closeup as indicated in inset in 1B.