STRUCTURAL ANALYSIS OF AN INTERIOR LAYERED DEPOSIT IN SOUTHERN COPRATES CHASMA, MARS. H. Racher[1], M. Slingerland[1], F. Fueten[1], R. Stesky[2], P. MacKinnon[1], E. Hauber[3], K. Gwinner[3], T. Zegers[4]. [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, The Netherlands.

Introduction: Interior layered deposits (ILD) are found throughout the canyon system of Valles Marineris. The origin and formation mechanism of ILDs are debated. They may include fluvial [1], aeolian [2], volcanism [3,4,5], subglacial [6,7] activity or the exhumation from material below trough walls [8]. It has also been suggested that ILDs formed as spring deposits [9]. A recent model for ILD formation (10) within western Candor Chasma suggests that deposition occurred synchronously with subsidence of early basins. Rotation of individually subsiding basin blocks may account for some of the observed layer attitudes. Here, observations from an ILD within southern Coprates Chasma (Fig.1A) are presented. These observations support this model.

Methodology: A High Resolution Stereo Camera (HRSC) panchromatic orthoimage obtained during orbit 2039, with 12.5 meters per pixel resolution and the corresponding DTM (50 m/pixel, interpolated to 13 m/pixel) form the initial data. A mosaic of three Context Camera (CTX) images (P01_001522_1677_XN_12S069W, P08_004054_1688 _XI_11S069W, P13_005966_1685_XI_11S069W) was constructed and registered to the HRSC image and the corresponding DTM. Both HRSC and CTX images were used to obtain attitude measurements of layering using ORION software. A HiRISE (High Resolution Imaging Science Experiment) image, PSP_004054_1675 is also register to the HRSC image and corresponding DTM. The HRSC image, CTX composite and HiRISE images were used to compare and confirm attitude measurements and trace layering.

Measurements and Observations: The triangular edged ILD (Fig.1B) is approximately 35 kilometers long from X-Z and 17 kilometers wide from the tip of the tear shaped mound to the mid point on the top of the main mound. The difference in elevation from X to Y has an elevation range of approximately 1km showing the western limits of the triangular edge is tilted (Fig.1C).

The majority of the layering measured is located in the higher stratigraphic section of the ILD (Fig.1B). The layering can be traced for distances from approximately 3 kilometers to 14 kilometers. Layering near Y dips 5º to 6º to the south. Layering on the top of the mound has an appearance of folding, truncations (Fig.1D). Layering near Z is essentially horizontal. Layering to the west of X is almost horizontal with a dip of 2º. A NW-SE trending break transects the ILD (dashed line) and the elevation drops 50 meters on the northeast side of the break (Fig.1B).

Also visible in the HiRISE parallel to the top of the triangular edge of the ILD are numerous fracture sets (Fig.1E). Further inward on the mound are numerous faults trending in an E-W orientation which is parallel to the Valles Marineris trend. There is no significant offset of any layering from the faulting and fracturing.

Discussion: We suggest the triangular edge of the ILD is a fault block that is rotated approximately 6 degrees to the south along the linear edges. The fractures parallel to the triangular edges are consistent with faulting along those edges. The cause of the faulting is uncertain. The rotation can be interpreted as a fault block back rotation. It would be consistent with the opening of a rift valley, suggestive of the Valles Marineris opening. All layering within the ILD was initially deposited horizontally and then back rotated as the fault block. At the western extent of the fault block is a NW-SE trending break and the layering to the west of this break is essentially horizontal. The truncations and folded appearance visible on top of the ILD are consistent with shallow angular unconformities. These features can be produced by deposition on top of a gently tilting floor. The tilting may not be the result of the present geometry of the fault block but other tilting episodes may be attributed to the folded appearance.

References: [1] Nedell, S. S. et al. (1987) *Icarus, 70*, 409–441. [2] Peterson, C. (1981) *Proc. 12th LPS*, 1459-1471. [3] Hynek, B. M. et al. (2003) *J. Geophys. Res., 108(E9)*, 5111, doi:10.1029/2003JE002062. [4] Chapman, M. G. (2002) *Geol. Soc. London, 202*, 273- 293. [5] Lucchitta, B. K. (1990) *Icarus, 86*, 476-509. [6] Chapman, M. G. et al. (2001) *J. Geophys. Res., 106(E5)*, 10,087-10,100. [7] Komatsu, G. et al. (2004) *Planet. Space Sci., 52*, 167-187. [8] Malin, M. C. and Edgett, K. S. (2000) *Science, 290*, 927-1938. [9] Rossi, A. P. et al. (2008) *J. Geophys. Res.*, in press. [10] Fueten, F. et al. (2008) *J. Geophys. Res., 113*, E10008, doi:10.1029/2007JE003053.

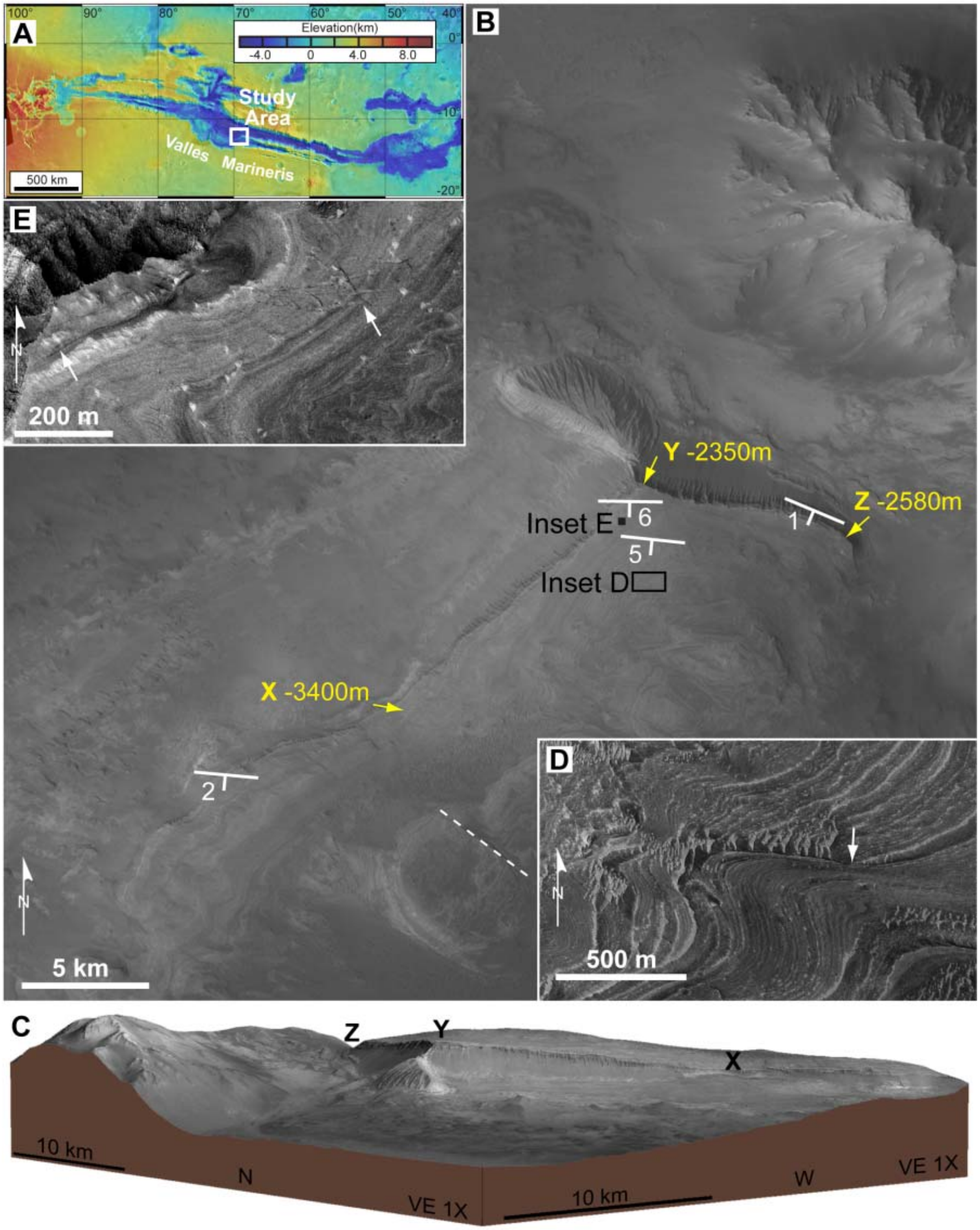

Figure 1: A. Location of ILD. B. HRSC image of ILD with representative layer attitudes indicated. C. 3D image of ILD with tilt of layering. Insets D, E indicate the locations of Fig. 1 D, E. Elevations of points X, Y, Z are indicated. White dashed line shows the NW-SE trending break. D. Truncated layer (arrow), interpreted as shallow angular unconformity observed in HiRISE image. E. Fracture sets (arrows) observed in HiRISE image near edge of ILD.