Stratigraphy and Attitude Measurements of Interior Layer Deposits in East Candor Chasma, Valles Marineris, Mars. A. Burden[1]<aburden@brocku.ca>, F. Fueten[2]<ffueten@brocku.ca>, R. Stesky[3], J. Flahaut[4], E. Hauber[5], [1]Department of Earth Sciences, Brock University, St. Catharines, Ontario,Canada L2S 3A1, [3]Pangaea Scientific, Brockville, Ontario, Canada K6V 5T5, [4]Institut de Recherche en Astrophysique et Planétologie, Université Paul Sabatier, CNRS UMR 5277, 31400 Toulouse, [5]Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany.

Introduction: Valles Marineris (VM) a system of chasms 4000 km long and up to 11 km deep located west of the Thrasis region of Mars[1]. VM formed when isolated collapsed ancestral basins were linked together by a series of grabens [2,3]. Interior Layered Deposits (ILDs) occur throughout VM. Their origin is still widely debated with several potential formation mechanisms proposed [refs in 4]. The presence of sulfates within the ILDs indicates that they formed in the presence of liquid water [5]. Examining layer attitude, structure and overall appearance will help interpret their formation and history. This study focuses on the large easternmost section of ILDs of East Candor Chasma.

East Candor Chasma: East Candor Chasma (Fig. 1A) is 475 km long, 145 km wide and ranges in elevation from -5.5 km to 3.5 km at the highest point within the ILD (Fig 1C). Previous mapping suggests that the geological history of the chasm is complex [6,7]. East Candor Chasma contains four separate mounds of ILD, two of which are examined here. The easternmost mound (Fig. 1D) is located near the eastern wall of the chasm. Unlike the other mounds in East Candor Chasma this mound trends north to south, is 17 km long and 14 km wide and ranges in elevation from -1km at the lowest point on north side of the mound to 1.8 km on the top of the mound. The second mound (Fig. 1F) is located 30 km west of the north-south mound. This mound trends east-west, is 100 km long and 50 km wide and ranges in elevation from -3.7 km to 3.6 km.

Methodology: A CTX mosaic registered to a HRSC composite DTM was used as a base-map for this study. CTX DTMs were calculated with the NASA Ames Stereo Pipeline [8,9]. Layer attitudes were measured using Orion software (Pangaea Scientific).

Results: The easternmost mound displays a prominent unconformity (Fig. 1D&E outlined in yellow). Below the unconformity layering, where it can be measured, dips towards the southeast at a relatively steep angle of 18°-19°. In 3D the layers below the unconformity appear gently curved, while layers above the unconformity are parallel to it, dipping ~ 9° to the northwest (Fig. 1D). Layering below the unconformity is only visible on the east side of the mound. On the west side of the mound the lower unit displays a distinctive erosional morphology, characterized by parallel linear depressions. The west side of the eastern mound is 1 km lower in elevation than the eastern side. This topographic low completely separates the easternmost mound from the adjacent ILD mound.

The adjacent ILD (Fig. 1F), 30 km west of the easternmost mound, displays two sets of layer attitudes separated by an unconformity. Layering closest to the easternmost mound dips ~ 10° north/northwest. Further west, 1.8-2.0 km higher in elevation, dips are ~ 10° to the southwest. Below the visible layering, the ILD exhibits the same erosional parallel erosional depressions as the easternmost mound below the unconformity.

Discussion: Dips in the easternmost mound are some of the steepest measured in ILDs within VM [eg., 1,10,11]. The mound is much smaller and oriented north-south, parallel to the adjacent chasm wall, while other mounds within East Candor are elongated parallel to the long axis of the chasm. It is not certain whether the orientation is merely the result of erosion.

The lowest portions of both mounds share the same distinctive erosional morphology. Immediately above this morphology both mounds are composed of shallow northerly dipping parallel layers. On the easternmost mound this morphological difference corresponds to a major angular unconformity and we suggest that this unconformity also exists on the adjacent mound. Other significant unconformities have been documented within ILDs in VM in West Candor and Hebes chasmata suggesting that ILD formation is a multiple stage process [4, 10, 11].

References: [1] Fueten, F. et al. (2014), J. Geophy. Res., 119, doi:10.1002/2013JE004557. [2] Schultz, R.A. (1998), Mars, Planet. Space Sci., 46, doi:10.1016/S00320633(98)00030-0. [3] Lucchitta, B. K. et al. (1994), J. Geophy. Res., 99, doi: 10.1029/93JE03095. [4] Fueten, F. et al. (2011), J. Geophy. Res., 116, doi:10.1029/2010JE003695. [5] Flahaut, J. et al. (2010a), J. Geophys. Res., E11007, doi:10.1029/2009JE003566. [6] Okubo, C.H. (2016) LPS LXXVII, Abstrac# 7009. [7] Le Deit, L. (2007) LPS XXXVIII, Abstract # 1845. [8] Broxton, M.J. and Edwards, L.J. (2008), LPS XXXIX, Abstract #2419. [9] Moratto, Z.M. et al. (2010), LPS XLI, Abstract # 2364 [10] Schmidt, G. et al. (2015), LPS XLVI, Abstract #1237 [11] Fueten, F. et al (2008) J. Geophy. Res., 113, doi:10.1029/2007JE003053.

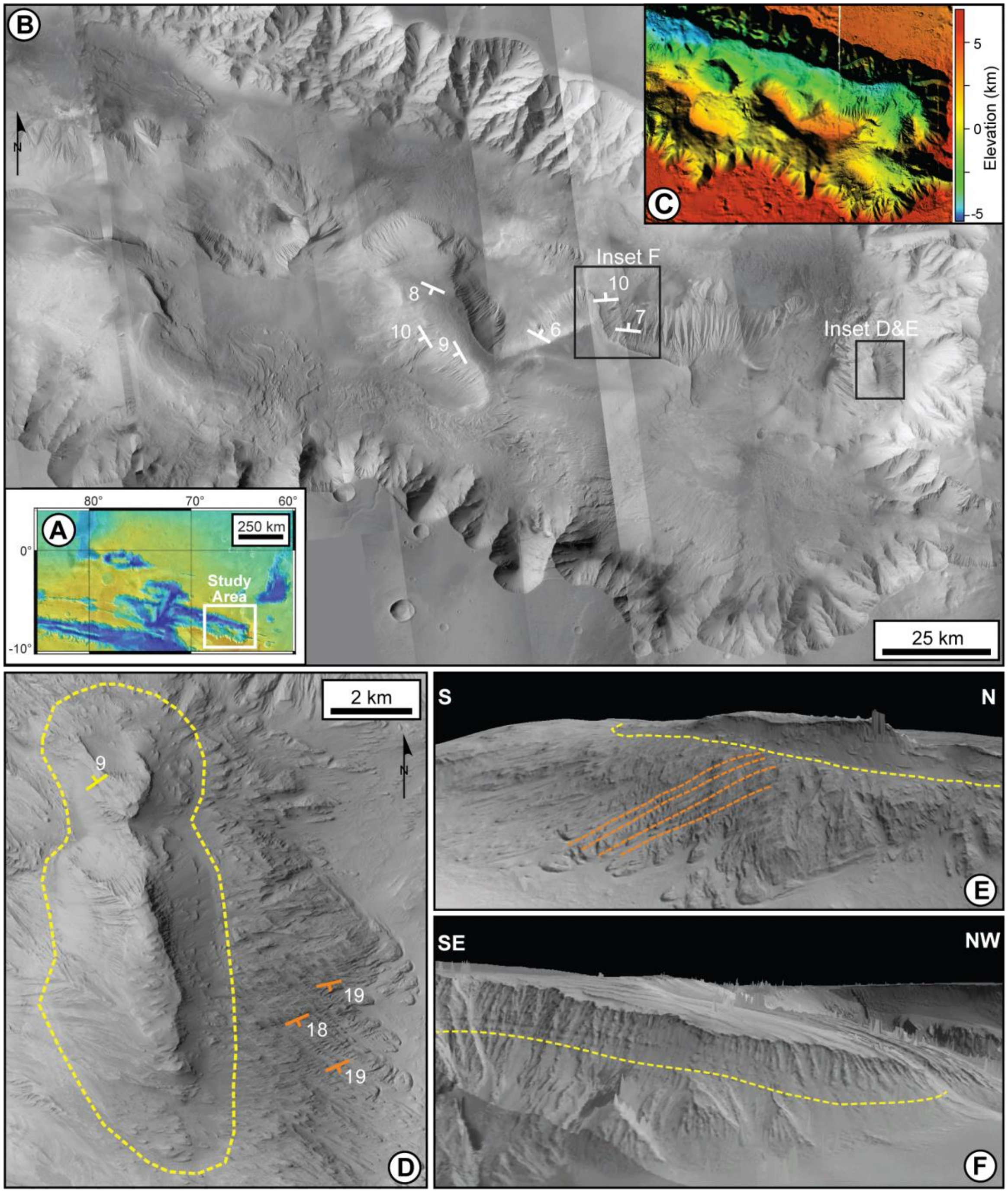

Figure 1. A: Location of East Candor. B: CTX Mosaic with attitude measurements. C: Composite HRSC DTM. D: Eastern-most mound, attitude below unconformity in orange, trace of unconformity in yellow, attitude above unconformity in yellow. E: 3D view of D with traced unconformity and layers below it. F: 3D view of second mound displaying trace of unconformity with layering above, distinctive erosional pattern below.