FRACTURE ORIENTATIONS WITHIN HIRISE IMAGES OF CETI MENSA, WEST CANDOR CHASMA, MARS. C. Birnie[1], F. Fueten[1], R. Stesky[2], E. Hauber[3], T. Zegers[4] and K. Gwinner[3] [1]Department of Earth Sciences, Brock University L2S 3A1, St. Catharines, Ontario, Canada <Colin.Birnie@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: Valles Marineris is thought to have resulted from a two-stage evolution in which isolated ancestral basins were linked during later extensional faulting [1,2,3]. Located within the chasms are interior layered deposits (ILD), the origins of which are still uncertain [e.g. 4]. Ceti Mensa, a large ILD in West Candor, with an area of >9000km^2 [5], reaches heights up to 2900m above the surrounding chasma floor.

Deformation of ILDs in West Candor by faulting [4,6] and fracturing [4] has been extensively documented. Southwest of Ceti Mensa, thrust faults and normal faults within the ILDs have been observed but not strike-slip faults [7]. Three major chasma-forming normal faults are proposed for the formation of West Candor, trending 106° [8] (Fig. B). However, no faults with the appropriate orientation or of sufficient size are expressed at the surface within ILDs and therefore cannot be linked with these basement faults [7].

The purpose of this study is to examine faulting and fracturing on and around Ceti Mensa within HiRISE images. The hypothesis is that the surficial fracturing reflects the underlying structure of larger faults**.** Ceti Mensa is well suited for this purpose because of the extensive HiRISE [9] coverage.

Methodology: Seven CTX images [10] were registered to HRSC data [11] of Ceti Mensa to construct a base map mosaic. Twenty-two HiRISE images (Fig. B) were examined for this study, with their locations recorded on the CTX mosaic.

Where not obscured by dunes or dust cover, fracturing can be observed throughout the area. Preliminary observations allowed the categorization of deformation features into several categories; 1) *Large Fracture Sets* are defined as parallel sets of fractures greater than 100 m long with a generally consistent orientation (Fig. E). 2) *Small Fracture Sets* are parallel sets of fractures less than 100 m long and with only one orientation (Fig. D). Where two orthogonal fracture sets intersect, a polygonal pattern is produced (Fig. F). One fracture set is generally dominant and more continuous and recorded on Fig. B. If both orientations are equally continuous, both are recorded. 3) *En Echelon Fracture Sets*. Multiple fractures in an apparent en echelon pattern (Fig. C). The sense of offset is preserved in the map symbol. 4) *Solitary Fractures*. Isolated fractures not occurring in sets and are generally more curved than other types of fractures. 5) *Faults* display an offset in layering. All fault and fracture orientations were measured in plan view.

Observations and Discussion: Sixty-two fracture sets were measured, ranging in orientation from 003°-177°, indicating there is no single consistent trend. Fault and fracture orientations near the NW scarp of Ceti Mensa, interpreted as a fault [12], are nearly parallel to the scarp. Predominant fracture orientations to the southeast of the study area trend NW-SE, similar to faults and fracture sets observed in the area [4]. These also appear to approximately coincide with the NW-SE trending edge of Ceti Mensa.

Fracture sets in the southern portion of our study area have an average trend of 140.5°, differing considerably from the 45.5° trend of thrust and normal faults observed to the SW of the study area [7].

A complex fracture pattern of multiple orientations observed in the northeast may be produced by the intersection of an E-W trend observed to the west and a NW-SE trend observed in the south. Faults and fractures are rarely observed within the same area. One occasion where they coincide, fractures appear to be cut by the fault.

Conclusion: The observed fractures exist at a wide range of orientations and are generally not parallel to the trend of the major basin forming faults. In some cases fracture trends parallel the edges of Ceti Mensa. These results are preliminary and further research is ongoing.

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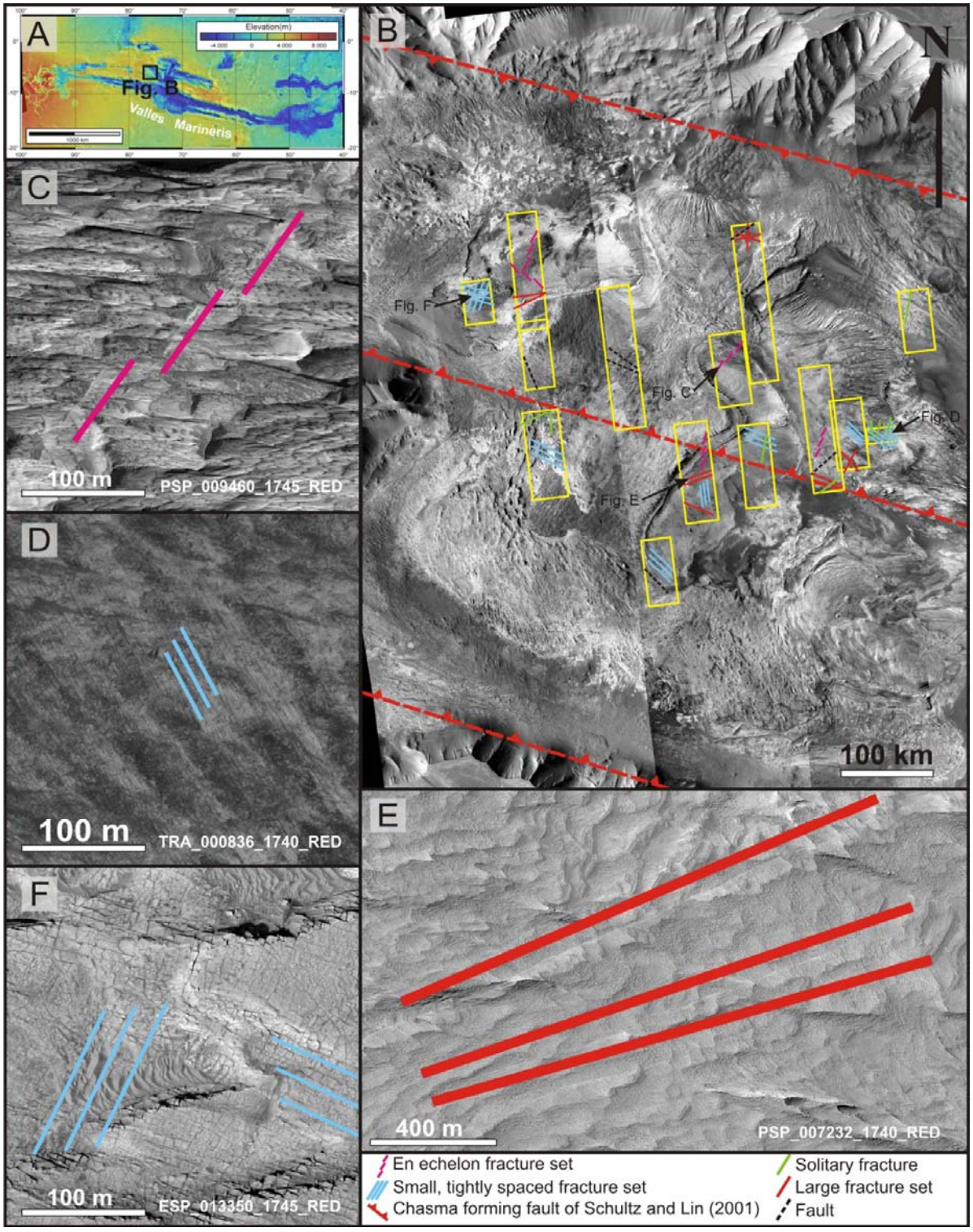

Figure 1. A - Location of study area. **B** - CTX mosaic with HiRISE image locations and orientations of faults and fractures. Symbols denote the orientation as well as shear sense for En Echelon fractures but are not to scale. Red dashed lines indicate the locations of chasma-forming normal faults proposed by Schultz and Lin [2001]. Triangles are on the hanging wall side of each fault. **C** - En echelon fracture set with a sinistral offset and 035° orientation. **D** - Tightly spaced small fracture sets with 150° orientation. **E** - Large fracture sets oriented 065°. **F** - Two, continuous fracture orientations (105° & 025°) creating a regular polygonal pattern.