FAULTING OF ILD DEPOSITS ON CETI MENSA, WESTERN CANDOR CHASMA, MARS.
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Introduction: Valles Marineris (VM) has been compared to terrestrial grabens and continental rifts [1] and faults within it have been the focus of extensive work, e.g., [2, 3]. Unlike most terrestrial rifts and grabens, VM contains interior layered deposits (ILDs), the origin of which remains enigmatic, despite numerous studies. Recent studies of ILDs in western Candor Chasma [4, 5] reveal a stratification consisting of lower competent, massively- and moderately-layered units, overlain by incompetent, thinly-layered strata composed of alternating low- and high-albedo materials. In some locations, the two units appear to be concordant, but at others they are separated by a distinct unconformity [5]. Work on Ceti Mensa (CM) [4] outlines the stratigraphy and suggests that the CM strata are non-flat units in two domal edifices. We present detailed structural observations based on new HRSC data and suggest new implications for the origin of CM and the timing of faulting within VM.

Geological Setting and Data: CM is located in westernmost Candor Chasma (Fig. 1A). Topographically it consists of two domal shapes, flanked in several places by large scarps, one of which is the focus here. Our data consists of the multispectral image and DTM calculated from HRSC data collected during orbit 2138. The image has a spatial resolution of 12.5 m and the DTM, 50 m. Pangaea Scientific's software ORION was used to calculate the layering attitudes [6] and analyze the image.

Observations: Our study focused on the major scarp (Fig. 1B) which is approximately 16 km long with a relief of 1.4 km. The scarp is very planar, trending 263° with variations in dip between 28° and 36°. Unconformities within what have been referred to as moderately layered units [4] are clearly visible within the upper portion of the scarp.

At the eastern end of the scarp, erosion has produced a semi-circular 5-10 km wide depression. Here the units dip approximately 10° and follow the overall trend of the topography. On strike with the scarp, at the opposing wall of the depression, a series of linear features are present within the lower portion of the stratigraphy (Figs. 1C, D). The majority of the linear features trend approximately 260°, parallel to the strike of the scarp, though trends closer to 270-275° are present. The linear features are steps with the north side down and elevation differences of 10-50 m (Fig. 1E, F)). These linear features are not observed at upper stratigraphic levels (Fig. 1E).

Discussion: We interpret the large scarp to be a normal fault with a minimum displacement of 1.4 km and post-dating the deposition of at least 1.4 km of thickness of ILD material. The dip angle is lower than commonly assumed for crustal faults, e.g., [1], suggesting that these faults may account for more horizontal displacement than previously considered. The small linear features at the eastern end of the scarp most likely represent minor late fault motion in a setting in which the lower- most ILD units are deposited near the end of the active faulting while the upper-most units postdate faulting and show no offsets.

The identification of the fault suggests a new interpretation of CM in a more regional scale. The scarp discussed here forms the edge of one of the domal features within CM. We suggest that CM is composed of two ancestral fault blocks which tilt inwards as illustrated in Fig 1G. The overall topography supports this interpretation. The angle of rotation of each block (exaggerated in the figure) is likely less than 5°. The inward rotation is compatible with models of chasm opening or collapse resulting from the depletion of underlying crustal material. Our hypothesis also suggests that the lower more competent units of the ILD were present during at least the later stages of the collapse.

Conclusion: We present the hypothesis that active normal faulting within CM continued until at least 1.4 km of ILD material had been deposited and that only a thin blanket of ILD material postdates fault motion. We further suggest that the domal topography of CM can be explained the inward tilt of two fault blocks. Future work will be aimed at testing this hypothesis.

References: [1] Schultz, 1998, *Planet. Space Sci. 46*, 827-834. [2] Schultz, 2000, *Tectonophys. 316*, 169-193. [3] Peulvast et al., 2001, *Geomorph. 37*, 329-352. [4] Gaddis et al., 2006, *LPS XXXVII*, Abstract #2072. [5] Fueten et al., 2007, this volume. [6] Fueten et al., 2005, *Icarus 175*, 68-77.

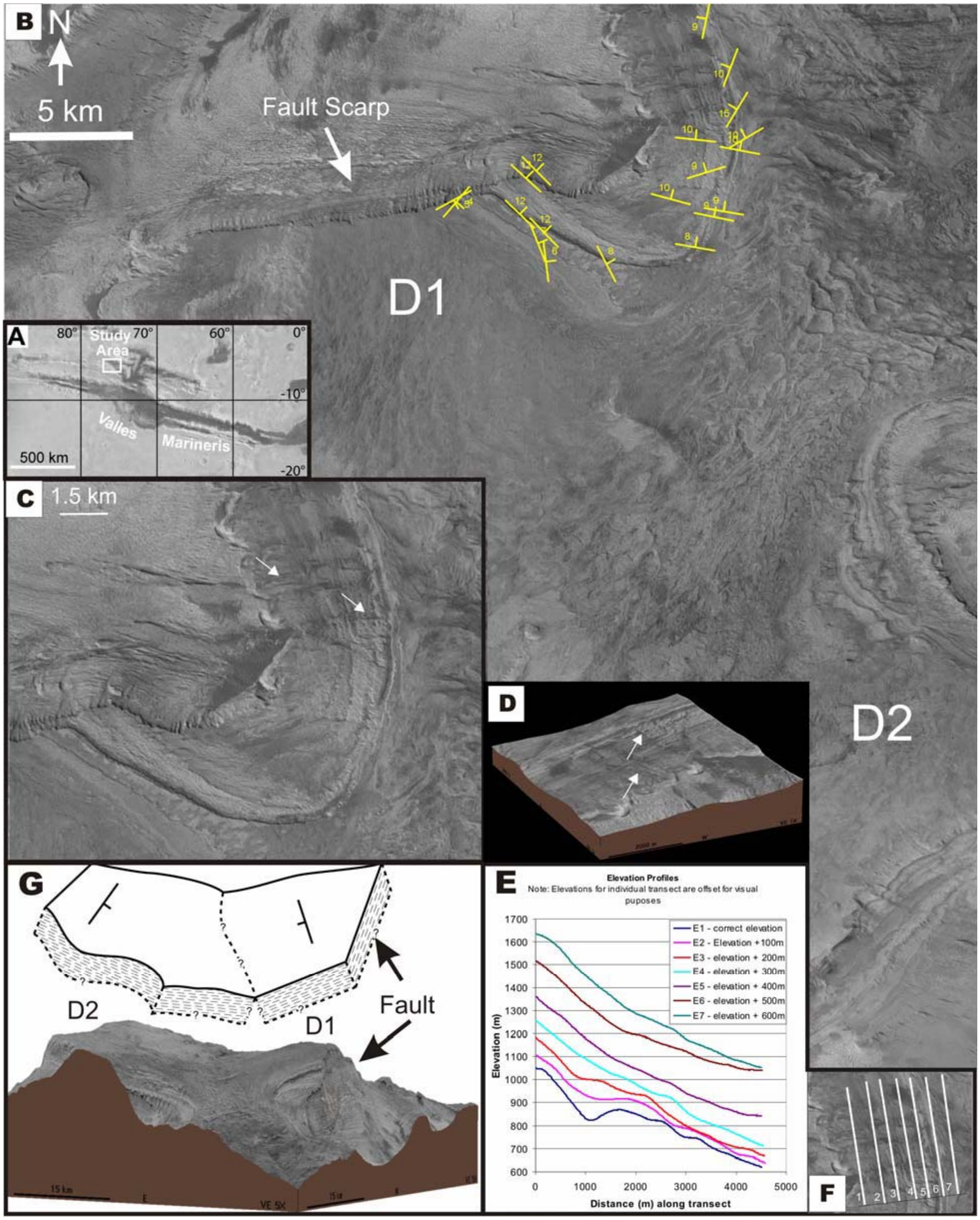

Figure 1. A – Location of study area. **B** - HRSC image with measurements, Domes D1, D2 and fault labeled. **C** - close-up of semi-circular depression, two linear features marked with arrows. **D** - 3D view from NW of linear features. **E** - Elevation profiles. E1-E4 indicate elevation drops across linear feature, E5-E7 do not. **F** - Location of elevation profiles. **G** -3D view of CM, (vertical exaggeration 5X) with schematic fault block interpretation.