LAYER THICKNESS DETERMINATION OF INTERIOR LAYERED DEPOSITS, WITH PARTICULAR EMPHASIS ON CANDOR MENSA, MARS. F. Fueten[1], R. Harvey[1], R. Stesky[2,] E. Hauber[3], A. Rossi[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] Jacobs University Bremen, 28759 Bremen, Germany.

Introduction: Interior layered deposits (ILDs) occur throughout the chasmata of Valles Marineris [1], yet their origin remains uncertain. Most theories propose that ILDs fill chasms; however, several infill mechanism have been proposed (see references in [2]).

Detailed examination of the layering can help to narrow the range of deposition mechanisms. A few studies [e.g 2,3] have provided estimates of layer thicknesses. Here we measure layer thicknesses within one large ILD, as well as at several separate locations. The aim of the study is to document stratigraphic and regional similarities and differences.

Candor Mensa: Candor Mensa is a large ILD within West Candor Chasma (Fig 1A). While no clear basement is exposed, the best estimate for the elevation floor of this part of the chasma is ~-4700 m to -4300 m (Fig 1B). Within CTX images, layering can be detected at elevations as low as -4700 m in the north and at -4500 m near the southern tip of Candor Mensa. With a peak at ~3360 m, Candor Mensa can, to a first approximation, thus be described as an 8 km high ILD deposited on a level floor.

Methodology: HiRISE images were rescaled to 1 m/pixel and registered to a HRSC and DEM mosaic. Measurements were taken along multiple transects of 200 m in length, aligned parallel to slope of the wall. Layers were counted along each transect. The attitude of the wall slope, the mean elevation of the transect and, where possible, the attitude of the layering were recorded. Average thicknesses of layers were calculated for each transect and where possible, corrected for the apparent dip. To test the accuracy of this measurement, a 30 cm DEM grid was constructed from HiRISE images (PSP_009038_1745 and PSP_010027_1745) and individual layer thicknesses measured. Measurements were made at various locations in Candor and Ophir chasmata (Fig 1C).

Results: 15 HiRISE images proved suitable for measurements. 310 transect measurements were made, of which 237 were corrected for apparent dip. The average correction was 0.95 m, so all data are used subsequantly. Measurements span an elevation range from -2500 m to 1500 m. The average thickness of directly measured layers using the HiRISE DTM of 6.7 m compares well an average thickness of 6.8 m measured using the transect method (Fig 1D. It also demonstrates that individual layer thicknesses vary less than an order of magnitude.

On Candor Mensa the layering consist of 2 major units, based on layer thicknesses (Fig 1E). The layer thickness in the lower-most unit varied from 4-14 m. Layer thickness in the upper unit ranged from <1 m to 5 m. No unconformity could be found between the units on Candor Mensa. No north-south variation in thickness, that might be linked to proximity to source region, was observed. (Fig 1F).

The layer thicknesses for all ILDs measured fall in the same range. Of particular interest is an area immediately southwest of Candor Mensa where the layers have the same low thicknesses as those in the upper Candor Mensa unit, but at a much lower elevation (Fig 1G, green data; 1B, green dots).

Visual Observations. In some locations fracture sets offsetting layers made measurements impossible. Such fractures were observed at all elevations. In many localities, individual layers could be traced for several kilometres (Fig 1H). No angular unconformities or localized thickness variations (e.g., channels) were observed anywwhere. No layer that was significantly thicker (order of magnitude) than its adjacent layers was observed.

Discussion: On Candor Mensa there are two distinct layer thickness-based units. A lower unit with layering about 4 m to 10 m in thickness and an upper unit with layering <1 m to 6 m in thickness. The nature of this boundary and the related changes will be the focus of further study. The continuity of layers over the entire examined stratigraphic thickness and the lack of unconformities suggests a stable depositional environment. The lack of N to S layer thickness variation on Candor Mensa and the lack features such as channels do not allow for the identification of any source regions for this deposit. Data for all measurements fall in the same range suggesting a distant source and uniform deposition mechanism in a low energy environment.

References: [1] Lucchitta, B.K., N.K. Isbell, and A. Howington-Kraus (1994), *J. Geophy. Res., 99*, 3783-3798. [2] Fueten, F. et al. (2010), *EPSL*, 294, 343-356, doi:10.1016/j.epsl.2009.11.004. [3] Lewis, *et al.* (2008) *Science* 322, 1532; DOI: 10.1126/ science. 1161870

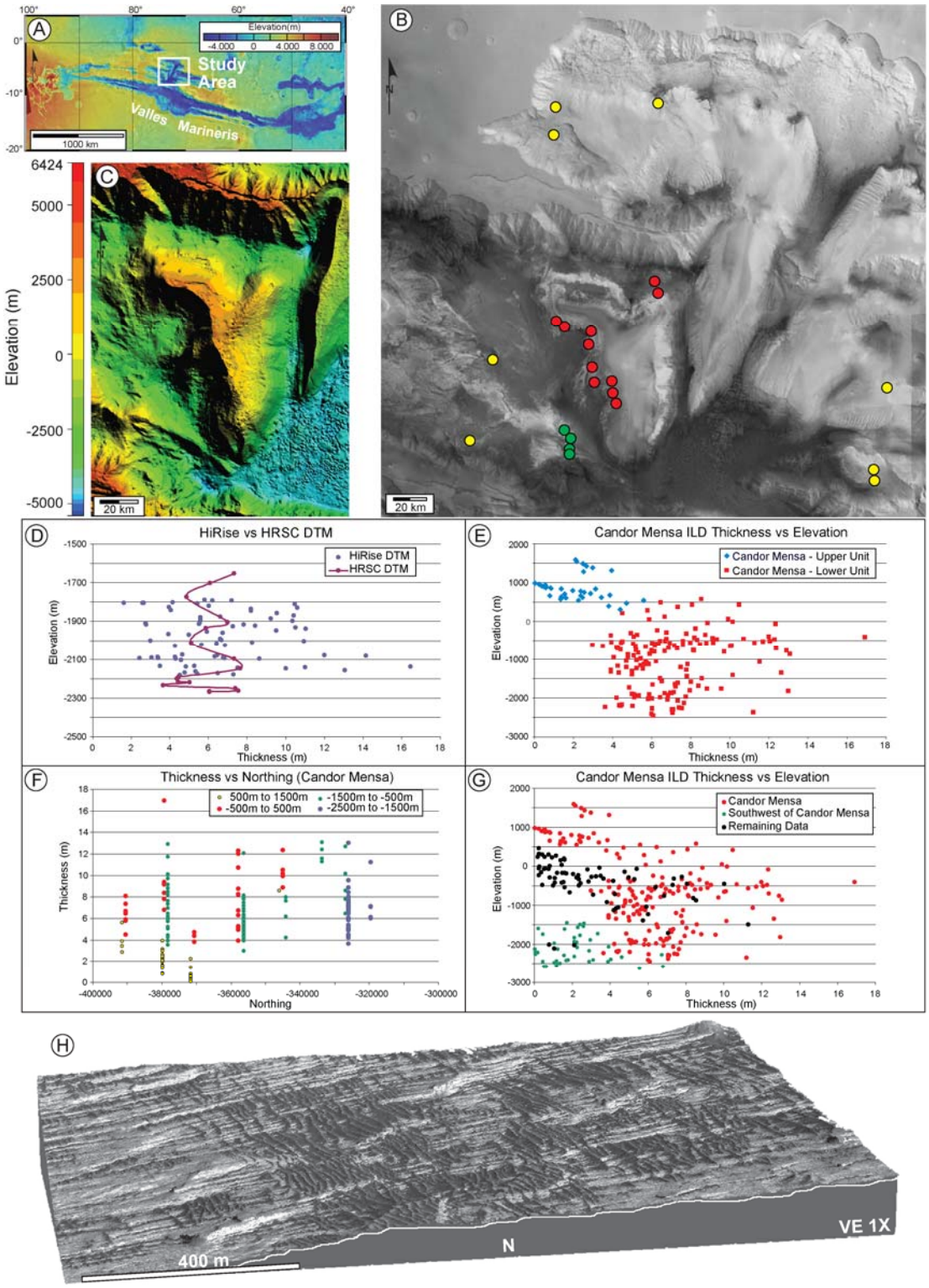

Figure 1: (A) Location of study area; (B) Sample locations; (C) Candor Mensa (HRSC DEM orbits 0360,0334); (D) Thickness of individual-layer (blue) vs transect averages (red); (E,F,G) All data are transect averages; (H) 3D view of HiRISE image with HiRISE DEM (0.5m/pixel) illustrating continuity of layers.