Layer Thickness Measurements, Structural Analysis, and Mineralogical Investigation of the Ganges Chasma Interior Layered Deposit, Valles Marineris, Mars. A. Hore[1], F. Fueten[1], J. Flahaut[2], R. Stesky[3], A.P. Rossi[4], E. Hauber[5]. [1]Department of Earth Sciences, Brock University, St. Catharines, Ontario, Canada L2S 3A1 <ffueten@brocku.ca>; [2]Vrije Universiteit Amsterdam (VU), The Netherlands; [3]Pangaea Scientific, Brockville, Ontario, Canada K6V 5T5; [4]Jacobs University Bremen, 28759 Bremen, Germany; [5]Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany.

Introduction: The Valles Marineris (VM) chasmata are thought to have been formed during a two-stage process. Early ancestral basins [1] were later linked to result in the current topography [2]. Interior layered deposits (ILDs) occur throughout VM, yet their origin(s) remain uncertain. Several formation mechanisms having been proposed [refs in 3].

Studies determining layer thickness and attitudes, as well as mineralogy studies, provide insights into the ILD deposition and formation mechanisms [3]. This study focuses on the single ILD located within Ganges Chasma.

Ganges Chasma ILD: Ganges Chasma is located at the eastern end of the VM (Fig. 1A). The large ILD [4] located within the chasma ranges in elevation from approximately -4000 m at the chasma floor up to 250 m. Sand sheets and dune fields are located to the north and south of this ILD [5].

Methodology: A CTX mosaic was used as a base-map. Six HiRISE stereo pairs were used:

	Image 1	Image 2
H1	PSP_006519_1730	PSP_007020_1730
H2	ESP_013059_1725	ESP_012993_1725
H3	PSP_002550_1725	PSP_003618_1725
H4	ESP_011648_1730	ESP_011582_1730
H5	ESP_018162_1730	ESP_018663_1730
H6	PSP_007877_1725	PSP_007521_1725

These images were used to calculate HiRISE DTMs (1 m/pixel) with the NASA Ames Stereo Pipeline [6,7]. The absolute values for the HiRISE DTMs were adjusted to HRSC topography. Multiple transects for each HiRISE image were used to measure layer thickness. Layer visibility dictated transect location and length. The layer attitudes were measured using Orion software (Pangaea Scientific).

Results: The Ganges ILD is dominated by three major benches (Fig. 1B). The bottom bench is more inclined while the top bench is nearly horizontal. The northern edge of bench 1 is observed at elevations between -2700 m and -2300 m, bench 2 is between -2200 m and -1900 m, and bench 3 is found between -1500 m and -1000 m. HiRISE images generally cover more than one bench (Fig. 1B).

Layer attitudes as measured within HiRISE DTMs indicate shallow dips with an overall average dip of 10.5°. The northern-most HiRISE image PSP_006519_1730 showed the most significant east-west variation in attitudes, while variation in layering within the other images was more confined to dip variations about a north–south strike direction. Locally, layer attitudes appeared to follow the general topography of the benches.

At 12 separate locations within the ILD, layering is disrupted along strike on the scale of 40-100 m or more (Fig. 1C and 1D). In these locations, layering is folded in a trough-like formation, disturbing layering stratigraphically below it. Morphologically, these formations resemble terrestrial soft sediment deformation (SSD) features on a massive scale [8]. The largest cluster of these features is located at lower elevations below bench 1 (Fig. 1C, image H1). Fewer SSD features are found at higher elevations and these typically do not exhibit the same distinct appearance.

In total, 2082 layer thicknesses were measured along 118 transects (Fig. 1E). All images had similar average thicknesses; H1 had an average of 0.72 m; H2, 1.15 m; H3, 1.39 m; H4, 0.80 m; H5, 1.67 m; and H6, 2.39 m, with an overall average of 1.04 m. Only 11 measurements had layer thicknesses in excess of 10 m.

Discussion: The benches are most likely a depositional, rather than erosional feature. Differences in bench attitudes may be attributed to draping of sediment over basement topography at lower elevations (bench 1 and 2).

The data covers approx. 2.5 km of stratigraphy. The majority of layer thicknesses appear consistent throughout the ILD. No layer thickness variations are associated with the benches. Based on the initial CRISM analysis [9], monohydrated sulfate is the dominant observable mineral in the measured strata.

Additional CRISM data and mineralogical investigation is currently in progress. This work aims to document stratigraphic relationships, compare layer thicknesses with other ILDs within Valles Marineris and discover ILD deformation mechanisms.

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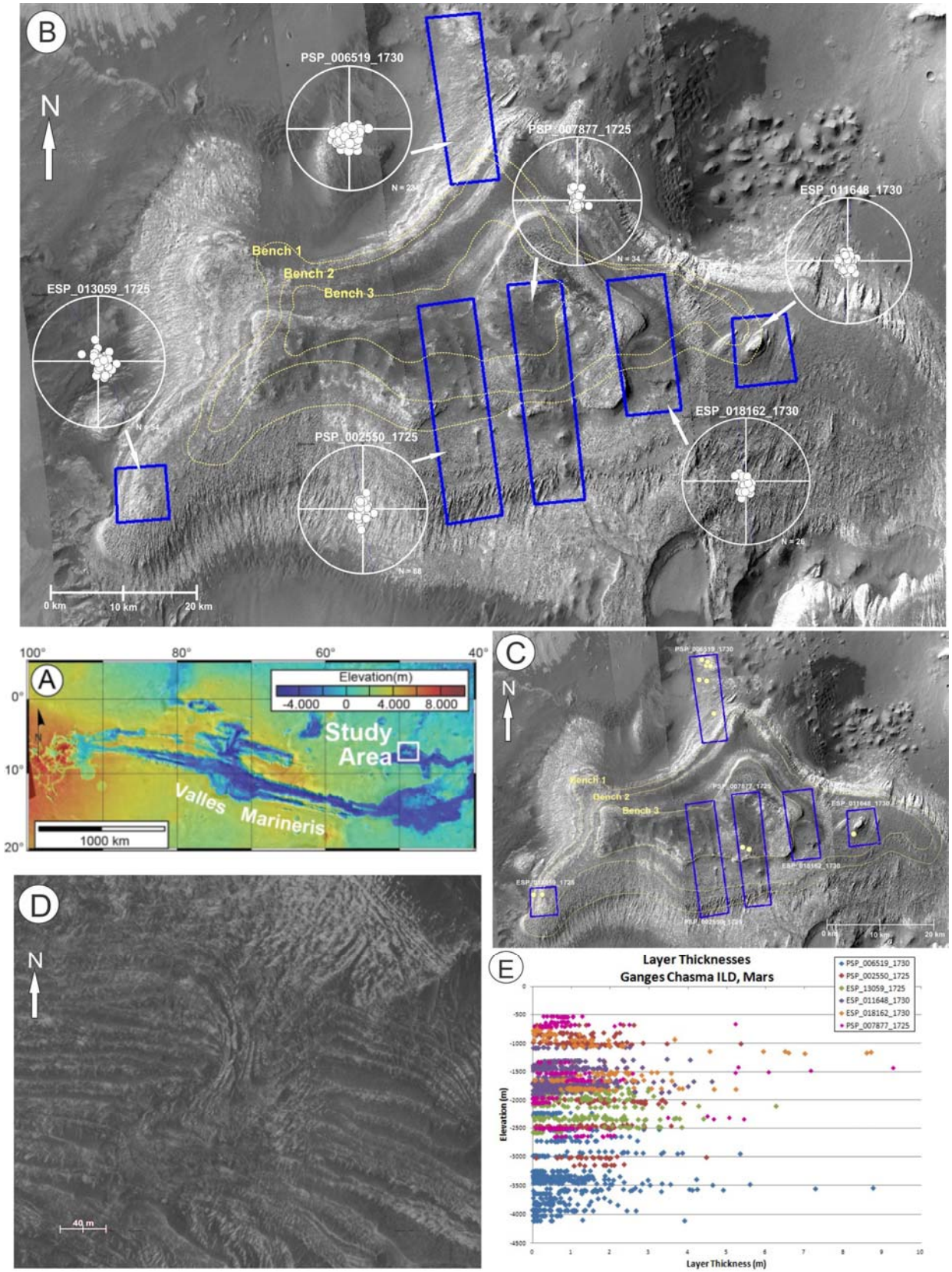

Figure 1: A) Study area location; B) HiRISE image locations with bench labels and stereonet insets (blue images used; red obtained but not used for analysis); C) Soft sedimentary feature locations (yellow dots); D) Soft sedimentary feature; E) ILD layer thicknesses