Layer Attitude and Thickness Measurements of Three Interior Layered Deposits within Capri Chasma, Mars. L. Calvert[1], F. Fueten[1], J. Flahaut[2,] R. Stesky[3], A.P. Rossi[4], E. Hauber[5], C. Quantin-Nataf [6].[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. [6]Laboratoire de Géologie de Lyon, UMR CNRS 5276, Université Claude Bernard/Ecole Normale Supérieure de Lyon, France.

Introduction: The formation of the up-to-11 km deep chasmata of Valles Marineris (Fig 1A) is thought to have taken place during a two-stage process [1, 2] in which early ancestral basin formation was followed by the linking of the basins into their current geometry [3, 1]. Interior layered deposits (ILDs) occur throughout the chasmata of Valles Marineris [1]. Multiple infill mechanisms have been proposed (see references in [4]). ILDs are also associated with hydrated minerals and can thus provide valuable information on the early history of Mars (see references in [5, 6])

Detailed examination of the layering can help to narrow the range of deposition mechanisms [e.g 4]. Here we measure layers attitudes and thicknesses within three ILD outcrops within Capri Chasma.

Capri Chasma ILD: Capri Chasma, the largest chasmata within Valles Marineris with an area of ~650 km x ~350 km, is the easternmost outlet of the chasma system. The three outcrops examined here are located along the northern extent of the ILD (Fig 1b) and have been mapped [5, 6, their fig 7a, c, e]. One of these outcrops is composed of monohydrated sulfate (Fig 1C, D, E) while other two contain the contact between mono- and polyhydrated sulfates (Fig 1F to K).

Methodology: Three HiRISE stereo pairs (Fig 1B) were used to calculate HiRISE DTMs (1m/pixel) with the NASA Ames Stereo Pipeline [7,8]. The absolute values for the HiRISE DTMs were adjusted to MOLA topography. Thickness of layers were measured within a GIS program along multiple transects. Layer strike and dip was measured using ORION.

Results: *Stereo Pair 1 (Fig 1 C, D, E).* The lower portion of this massive bright outcrop [6] shows well developed layering that dips ~ 12° towards the SE. This unit is overlain by similarly light-toned material with shallower dip of ~5° (Fig. 1 C, D, see dashed lines). Layering is defined by benches of light toned material with an average thickness of 7 m, that are decorated by dark material.

Stereo Pair 2 (Fig 1 F, G, H) Layer attitudes within this outcrop consistently dip ~12° towards the E as does the contact marked by the albedo change. Average layer thickness below -3000 m is 3.6 m, while above -3000 m it is 2.3 m. We were unable to correlate the contact to a single layer boundary.

Stereo Pair 3 (Fig 1 I, J, K) It was not possible to measure layer attitudes below the contact defined by the albedo change. Within the darker material layering consistently dips ~10° towards the NNE. The contact has the same attitude as layering along the eastern extent of the outrop, but cannot properly be measured in either NW or SW portions. If benches along the lower elevation of the outcrop are interpreted as layers, they measure 25 m on average. Well-developed layering below -1100 m has an average layer thickness of 7.5 m, the average above that elevation is 2 m.

Discussion: The outcrops examined here are separated by 65 km and 135 km and cannot be correlated temporally. The data indicate that there is considerable variation within ILDs within Capri Chasma.

While dips are generally shallow, dip directions vary between outcrops. Massive bright outcrops can be composed of distinctive units. The contact defined by the albedo change generally follows local layering but in detail cannot easily be associated with a single layer. The albedo change also does not coincide with the change in mineralogy observed within CRSIM data.

Layer thickness is on average less than 10 m but shows considerable variation. Packages of thinner layers were measured on top of the two ILD mounds (Fig 1 H, K). It is however not certain if this is simply a function of better visibility of layers in this setting.

This work is part of a larger project with the overall aim to document stratigraphic relationships and compare layer thicknesses of ILDs within Valles Marineris.

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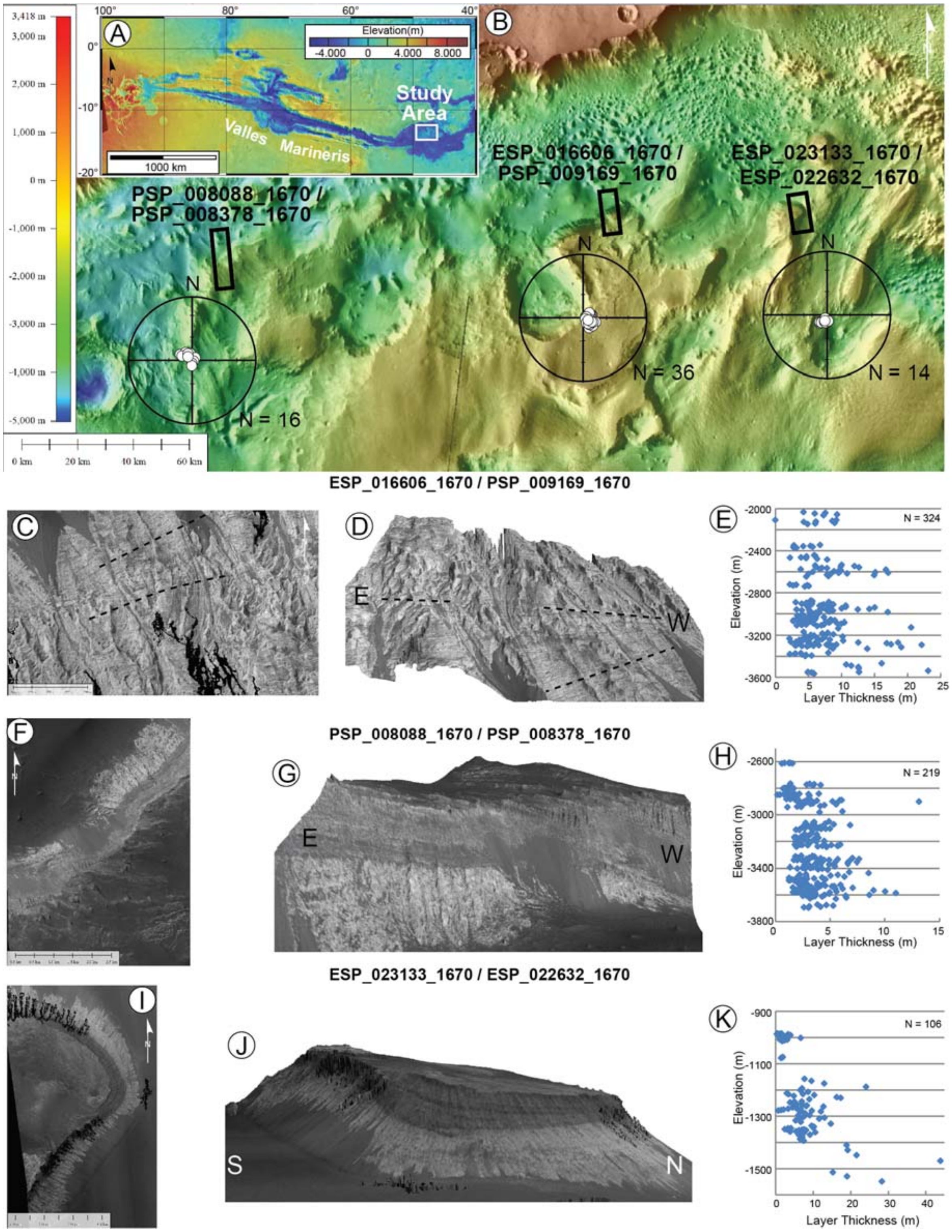

Figure 1: A) Location of study area. B) Composite image Themis Day IR with MOLA elevations, indicating locations of study sites, including stereonets of layer attitudes. C, D, F) map view of HiRISE images; D, G, J) 3D view of HiRISE images, E, H, K) Elevation vs. Layer thickness data.