STRATIGRAPHY AND DISTRIBUTION OF CLAYS WITHIN COPRATES CATENA AND HYDRAE CHASMA. C. M. Weitz[1] and J. L. Bishop[2], [1]Planetary Science Institute, 1700 E Fort Lowell, Suite 106, Tucson, AZ 85719 (weitz@psi.edu); [2]SETI Institute, 189 Bernardo Ave., Mountain View, CA 94043.

Introduction: We have targeted numerous HiRISE and CRISM images across Coprates Catena and Hydrae Chasma in order to explore the morphology and composition of light-toned deposits within these depressions. We also utilized Digital Terrain Models (DTMs) derived from both HiRISE and HRSC stereo images to measure strike and dips, and thicknesses of these deposits in order to infer stratigraphies of hydrated minerals within the deposits. The two troughs that we explore in detail at Coprates Catena (Coprates Catena 1&2) also contain terraced fans that have been interpreted as deltas [1-3].

Our goal in this study is to determine the composition and origin of the light-toned deposits, especially the clays, within these depressions and explore how these deposits compare to light-toned deposits within Valles Marineris (VM) and the Noachian clays identified along the VM plateau [4].

Coprates Catena 1 Deposits: This depression is 46x15 km in dimension and ~3 km deep. We analyzed CRISM spectra extracted from materials in the eastern portion of Coprates Catena 1 (Fig. 1) covered by images FRT000122AD and FRT000011DF2. We identified the same Fe/Mg-smectites and Al-phyllosilicates as [5] but also discovered a 2.2-2.3 µm doublet absorption and both lower and upper hydrated silica beds within these deposits. In addition, our analysis of HiRISE images showed the presence of breccias within the lower hydrated silica unit. The doublet absorption has been noted elsewhere in VM [5-7], in Noctis Labyrinthus [8,9], and at Mawrth Vallis [10], and is best explained by acidic alteration of clays. We used a HiRISE-derived DTM to measure strike and dip along several bedding planes within the deposits. Values range from 2-11° and dip inward towards the center of the trough, consistent with emplacement after opening of the trough [5].

Light-toned deposits near the base of the terraced fan in the western portion of Coprates Catena 1 were covered by two CRISM images. Unfortunately, one of the images (FRT0001EACC) was acquired when the atmosphere was dusty, and the second image (FRT0007203) was taken when the IR detector temperature was above the instrument limits so the data is noisy. Even though the data did not allow us to interpret mineralogy from the CRISM spectra, a hydration absorption at 1.9 µm is visible in all spectra extracted from the light-toned layered deposits. The morphology of these hydrated units from HiRISE imagery is most similar to the Fe/Mg-smectites, 2.2-2.3 µm doublet, and hydrated silica units identified in the eastern portion of the trough where clearer spectra were acquired.

Coprates Catena 2 Deposits: This depression is 47x21 km in dimension and ~3.5 km deep. CRISM analyses of image HRL0001B8AE by [3] indicate Fe/Mg-smectites associated with deposits in this trough. We analyzed this same HRL and also a newer FRT0001FB4F image that provided more coverage at a higher resolution of the deposits. Even though the HiRISE images show morphologic differences between a 230 m high light-toned deposit and the darker-toned materials that comprise the terraced fan (Fig. 2), CRISM spectra extracted from both units show similar absoprtions at 1.92 and 2.29-2.30 µm, albeit with different reflectance values and band depths. All spectra are consistent with a Fe-smectite, such as nontronite. Stratigraphic relantionships show the terraced fan is superimposed on the light-toned deposit. The light-toned smectite appears massive with faint layers visible only along upper exposures where we measured dips of 2° from a HiRISE DTM. The deposit was likely more extensive within the depression but is now best preserved in the south where it lies beneath a dark-toned caprock and along the base of the terraced fan where it extends across 400 m in elevation.

Hydrae Chasma: Hydrae Chasma is one of the smaller chasma of VM located to the north of Coprates Chasma and south of Juventae Chasma. This chasma represents an intermediate size depression (55x50 km, 4 km deep) containing numerous light-toned deposits at multiple elevations. CRISM spectra indicate many light-toned deposits (Fig. 3) exhibit features consistent with Fe/Mg-smectites, with absorptions at 1.41-1.43, 1.92, and 2.29-2.31 µm. Thinner and brighter beds are observed at both lower elevations within the chasma and directly above the smectites, but they are too small in exposure to be resolved by CRISM data. Strike and dips of layered beds measured from a HiRISE DTM have slopes between 2-4° towards the chasma center.

Discussion: The Coprates Catena deposits are dated to Late Hesperian [3] and Hydrae Chasma disrupts Early Hesperian volcanics [11], indicating relatively young aqueous activity formed these clay-bearing outcrops. Al-phyllosilicates and Fe/Mg-smectites occur along the VM plateau and are interpreted as possible pedogenic alteration during the Noachian and Hesperian [4]. Both Coprates Catena troughs have valleys flowing into them and associated terraced fans, suggesting water transported within the valleys produced the alteration that formed the clays. In con-

trast, no valleys intersect Hydrae Chasma, although we did identify several small valleys (Fig. 3) dissecting the smectites and following the slope towards the center of the chasma. Because the smectites in Hydrae Chasma occur across multiple elevations they most likely formed by alteration from hydrothermal activity and/or melting ice/snow.

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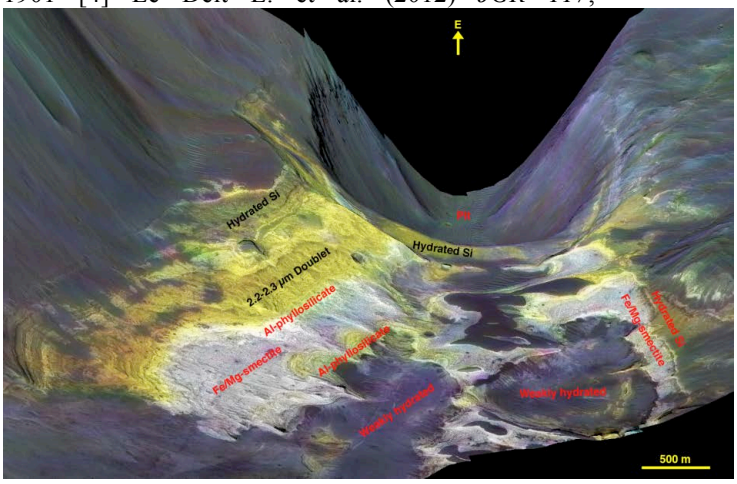

Figure 1. HiRISE DTM perspective view (5X VE) of eastern Coprates Catena 1 with CRISM spectral parameters [13] from FRT000122AD overlain in color (red is olivine index, green is 1.9 µm band depth, blue is band depth at 2.3 µm). Minerals identified from CRISM spectra are noted.

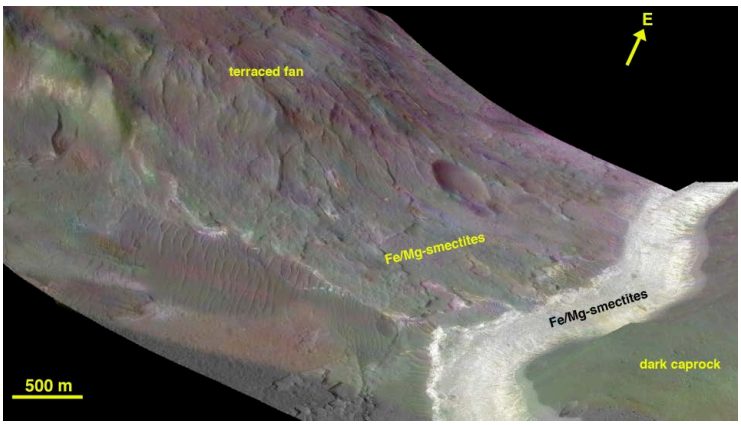

Figure 2. HiRISE DTM perspective view (5X VE) of Coprates Catena 2 with CRISM spectral parameters from FRT0001FB4F overlain in color (same as Fig. 1). A light-toned deposit (right) has a spectral signature consistent with Fe/Mg-smectites. Darker-toned materials associated with a terraced fan also exhibit Fe/Mg-smectite signatures. Additional minerals are likely present that are influencing the brightness.

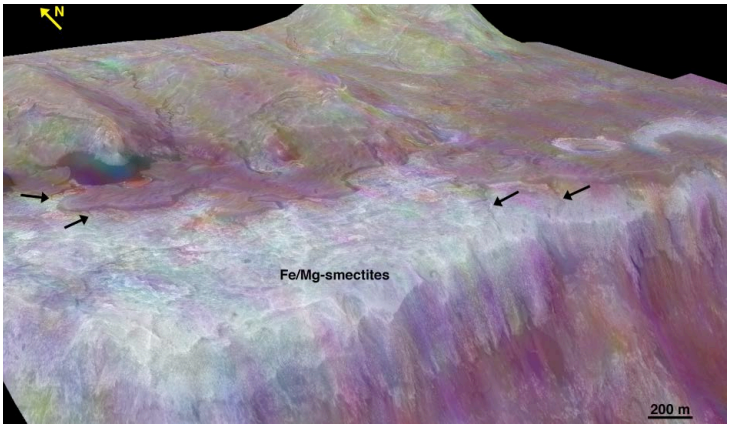

Figure 3. HiRISE DTM perspective view (5X VE) of Hydrae Chasma with CRISM spectral parameters from FRT00013730 overlain in color (same as Fig. 1). The light-toned deposits have a spectral signature consistent with Fe/Mg-smectites. Black arrows identify small valleys that dissect the smectites and flow towards the chasma center.