GEOLOGIC MAPPING OF THE COPRATES CHASMA (MTM -15057), MARS: YEAR 2. M. Chojnacki[1], B. M. Hynek[2-3], S. R. Black[2-3], R. Hoover[2], and J. R. Martin[2]. [1]Lunar and Planetary Lab, University of Arizona, Tucson, AZ, 85721(chojan1@pirl.lpl.arizona.edu); [2]Laboratory for Atmospheric and Space Physics & [3]Dept. of Geological Sciences, University of Colorado-Boulder, Campus Box 600 UCB, Boulder, CO 80303.

Introduction: The eastern part of the Valles Marineris and Coprates chasma, is fundamentally important to our understanding of crustal formation and modification processes as there is more crust exposed here (>11 km) than perhaps anywhere on Mars [1, 2]. These exposures are relatively unobscured, partially due to the lack of interior layered deposits that elsewhere mask wall contacts. The primary objective of this 2013 PGG-funded study is to produce a geologic map of the Coprates chasma quadrangle (MTM-15057) at the 1:500,000-scale that will be submitted for peer-review and publication by the USGS.

Datasets: A 6 m/pix visible wavelength CTX mosaic was used for the basemap. We supplemented with 100 m/pix daytime and nighttime IR data from THEMIS for morphology and thermophysical properties, respectively. HiRISE coverage (25 cm/pix) exists for roughly 12% of the map region and eleven HiRISE DTMs (1 m/post) are located in key locales. HRSC stereo-derived DTMs (50 m/pix) provide additional topographic information. Finally, CRISM hyper- and multi-spectral cubes were consulted for compositional information.

Mapping update: To date, we have drafted a preliminary 1:500,000-scale geologic map (**Fig. 1**).

Plateau Units: Our plateau units above the canyon rim are fairly consistent with unit boundaries defined by *Tanaka et al.* [3] in the recent global map. These include numerous Middle Noachian through Early Hesperian units (Fig. 1). The oldest terrain occurs in the southwest/southcentral area of the map and includes a portion of an ancient volcanic edifice and degraded and structurally-deformed highlands. These are superposed by Late Noachian highlands exhibiting terrain of mottled albedo and varied topography. In places, fluviolacustrine processes have modified this surface. Within this unit is a light toned marker bed pocked with small craters and in places, this unit shows phyllosilicate signatures in CRISM data [*C. Weitz, pers. comm.*]. The youngest plateau units are smooth, lightly cratered terrains and are interpreted as Hesperian-aged lava flows. Most of the plateau units have been modified with wrinkle ridges, and a few larger craters, which sometimes show multilobate ejecta.

Canyon Wall Units: Mapping of canyon walls was initiated with the construction of more than a dozen HiRISE-based stratigraphic columns. In these, we find a laterally continuous sequence (*upper bedded unit north wall*) except for in the south central portion where the wall rock shows a different character (*upper bedded unit south wall*), which we interpret as the manifestation of the ancient Coprates Rise mountain range intersecting the canyon from the south. *Massive spur* units and occasional stretches of smooth wall units dominate wall sections to the north, south, and those of Nectaris Montes. These override *lower bedded units* that are in contact with canyon interior units. Spectral observations of Coprates chasma wall, landslide, and dune units show several classes of mafic- and phyllosilicate-bearing surfaces [4–6]. A distinct class of alteration products, known as “deep phyllosilicates”, and more discrete occurrences of hydrous Fe-bearing amorphous silicates are both found within the canyon wall stratigraphy [4, 7]. More recently, the intriguing phenomena of recurring slope lineae (RSL) or potential salty water seeps have been detected among central wall units [8] and our ongoing analysis will attempt to correlate their occurrences with lithologic map units.

Canyon Interior Units: Mapping of the interior has revealed a diversity of units not resolved by previous efforts at coarser scales [3]. The 13 floor units encapsulated in Fig. 1 include: (1) *rough canyon floors* with hummocky textures and a sparse crater distribution (> 1 km diameter); (2) *smooth canyon floors* with fractures, polygonal terrain, often heavily cratered; (3) *rough mounds or blocks,* possessing spurs, talus, and occasional fine-layering; (4) *flat mounds* with a smooth table-like morphology; (5) *crater and ejecta materials*; (6) *crater interior deposits* consisting of hummocky materials; (7) *volcanic edifices* with small cone like structures; (8) *layered terrain* which are light in tone, patchy, and distributed on canyon floors and walls; (9) *landslide deposits* of rugged, sometimes lineated materials and varying runout distances; (10) *aeolian dune deposits* of low-albedo sand forming slip faces and masking lower-lying units; (11) *aeolian sand sheets* of mid-toned fine materials without prominent duneforms; (12) *resistant mantling units* of dark-toned, relatively thick (>5 m) flat deposits that retain small craters; (13) *blocky deposits* of concentrated, small (<500 m) blocks or mounds. Mapping thus far has revealed diverse and complex relationships within the canyon interior. Two classes of floor mounds are evident;

some possessing horizontal layering and representing sedimentary units that were presumably more extensive in the past and others with spur-and-gully morphology akin to wall rock. A separate class of sedimentary units with bright, fine layering and some containing hydrated sulfates [9] are present in topographic lows in the southwestern portion of the floor and maybe indicative of past aqueous processes. Relatively well-preserved, small volcanic edifices are scattered on the canyon floor and maybe signatures of Amazonian-aged mud volcanism [10]. Likewise, dark-toned, indurated mantling materials superpose many units in the canyon interior and their morphology suggests a geologically recent pyroclastic origin. Variable-age landslides and smaller fans cover many floor locations and attest to the canyon's long history of mass-wasting.

Fine-scale map areas: Additionally, we have initiated two of three planned 1:25,000-scale region of interest maps to discern the finer-scale details of stratigraphic relationships within the map area (**Fig. 1**). These sub-area maps provide fine scale details of key areas that can then be applied to the larger map region. One fine scale map was drafted in the southcentral-portion of the Coprates chasma where significant alteration minerals are present [11]. The other includes a catena (tectonic depression) that shows strong evidence of a paleolacustrine environment described in *Martin et al.* [12].

In summary, the detailed mapping is revealing a long and complex history for the formation and evolution of the Coprates chasma. Full results will be presented at the meeting.

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Figure 1. Geologic map of Coprates chasma MTM -15057. RSL locations are indicated by the blue circles. Two 1:25,000-scale region of interest maps are indicated with red boxes (see [11-12]). Full map including geologic unit descriptions will be provided at the meeting.