GEOLOGIC MAP OF TERRA CIMMERIA, MARS. A. G. Siwabessy[1,2], C. M. Rodrigue[1], and R. C. Anderson[2], [1]Department of Geography, California State University-Long Beach, 1250 Bellflower Boulevard, Long Beach, California 90840 (Andrew.siwabessy@student.csulb.edu), [2]Geophysics and Planetary Geosciences Group, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Boulevard, Pasadena, CA 91109

Introduction: The Tharsis Rise dominates the tectonic geomorphology of the western hemisphere of Mars. Anderson et al. [1] challenged the premise of [2], a prior study that presupposed that Tharsis uplifted in a single event centered near Pavonis Mons. [1] found instead that compressional and extensional features across the western hemisphere are controlled by five primary tectonic centers, of which the most ancient lies near the Claritas Rise. More recently, [3,4] studied putative basin and range topography on the southwest margin of the Tharsis Rise. [4] correlated the orientation of these features to predicted extension modeled by [5], but only if their model is rotated by 12° and then re-centered not on the predicted regime by [2] but on the Stage 1 Claritas center of [1]. This effectively associates (nearly) all explicit tectonic signatures on the southern highlands west of Thaumasia with the predicted incipient updoming of Tharsis at Claritas. When viewed on MOLA topography, the succession of basin and range topography appears to extend farther west towards Terra Cimmeria, albeit with more subdued relief. We perform 1:1M geologic mapping of Terra Cimmeria between the coordinates of 5°S and 40°S, and 130°E to 170°E on a THEMIS basemap, using CTX imagery for context. The objective is to constrain the structural history of the basins of Terra Cimmeria. Potential causative connections to Tharsis' incipience and to eastern-hemisphere tectonic centers identified by [6] are investigated in particular.

Geologic mapping results: At the time of this abstract's preparation, preliminary units are delineated for roughly the southern half of the mapping area. Crater counts and the mapping of tectonic features are planned after units have been completed for the entire map. All discussion henceforth is in relation to the tentatively completed area.

In the presently mapped region, basins tend to assume three distinct forms. In the southeast, basin-filling materials appear to be associated with the northwestern margins of the Eridania basin, home to a putative paleo-sea as described by [7]. These basins are expansive and complex and display no immediately evident geometric relationships. To the northwest towards Gale Crater, basins become aligned parallel to the piedmont margin of a raised highlands terrain. This apparent concentric geometry continues to the southwest of the mapping area, trending into Hesperia Planum. Further to the northwest, a third type of basin – by far the least mature of the three observed types – is observed. They are sometimes clearly associated with antecedent impact structures. As they are occasionally connected by cascading sequences of downslope-incising valleys, fluvial erosion may have occurred coevally with the regional uplift at [6]'s Hadriarca-Tyrrhena center.

Other than globally-distributed wrinkle ridge sets [8], explicit tectonic signatures associating Terra Cimmeria to regional forcers (such as Tharsis) are not observed. However, this does not necessarily limit forcing effects of far-field activity – particularly from Tharsis – from controlling the basin's subsurface geology and hydrology. (see LPSC 2020 abstract "Remanent magnetization signaures in Terra Cimmeria and Terra Sirenum, Mars, as a result of far-field tectonic and hydrological effects of the early uplift of the Tharsis Rise" by A. G. Siwabessy, C. M. Rodrigue, and R. C. Anderson, #1996).

Notably, Anderson et al. [6] predicted that one of the two primary tectonic centers of the eastern hemisphere of Mars is centered in Tyrrhena Terra. However, their compressional tectonic centers were only associated with wrinkle ridges at extraordinary distances from the tectonic centers. It is possible that signals of compression are too subtle to be explicitly manifested at the surface in the immediate vicinity of the Tyrrhena Terra center, and it is instead manifesting in blind thrusts or as scarps that cannot be readily identified upon visual inspection of orbital datasets. An analysis using MATLAB's Topotoolbox suite [9] on HRSC and MOLA digital elevation models might identify knickpoint lineaments in the early Noachian valley networks. This project is currently underway.

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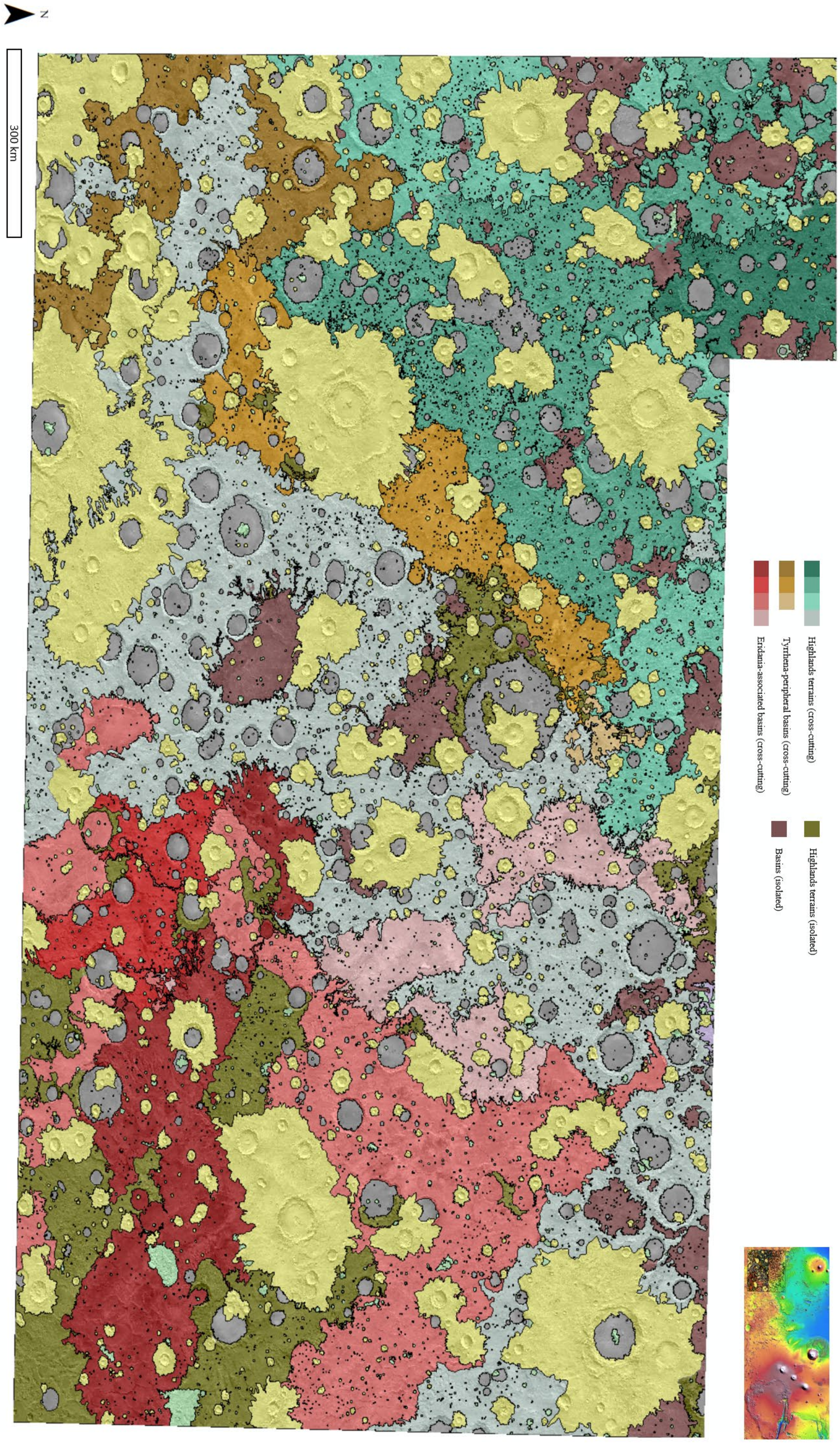
References: [1] Anderson et al. (2001): *JGR* 106(E9): 20563-20585, [2] Plescia & Saunders (1982): *JGR SE* 87(B12): 9775-9791, [3] Karasözen et al. (2016): *JGR P* 121: 916-943, [4] Anderson et al. (2019): *Icarus* 332: 132-150, [5] Banerdt et al. (1992). In Kieffer et al.: 249-297, [6] Anderson et al. (2008): *Icarus* 195: 537-546, [7] Irwin et al. (2002): *Science* 296: 2209-2212. [8] Raitala (1990): *ASR* 10(3-4): 71-73. [9] Schwanghart & Kuhn (2010): *EM&S* 770-781.


N
300 km
Highlands terrains (cross-cutting)
Tyrrhena-peripheral basins (cross-cutting)
Eridania-associated basins (cross-cutting)
Highlands terrains (isolated)
Basins (isolated)