AN EARLY LOOK AT THE GEOLOGIC AND TECTONIC HISTORY OF BATHYS PLANUM, MARS R.C. Anderson[1], T. Parker[1], J. Adrian[1], N. Fewell[1], and A. Siwabessy[1]; [1]Jet Propulsion Laboratory/California Institute of Technology, Pasadena, California, [2]University of Arizona, Tucson, AZ. (Robert.C.Anderson@jpl.nasa.gov).

Introduction: Structural mapping is vital to unraveling the geologic histories at local to global scales on Earth and Mars. For example, maps delineating structures of various ages can be used to characterize potential stress sources, strain magnitudes and fault history, and pre-existing structural controls that may relate to episodes of local or regional tectonism. For Mars, the formation of the Tharsis rise dominated the geologic and tectonic history of the western hemisphere of Mars. Bathys Planum region (**Fig. 1**) appears to be an area that was heavily affected by the initial formation of Claritas rise. This region is located on the southwestern flanks of the Tharsis and is centered at -35°S and 245°E. Due to its location, this region holds a significant key to improving our understanding of the timing of the formation of the Claritas rise. Detailed examination of the geologic units and tectonic structures within this region provides an excellent window into identifying the tectonic processes that influenced the geologic evolution of the western hemisphere region and Tharsis.

In this preliminary study, we have examined the spatial and temporal histories of the major fault systems within and surrounding the Bathys Planum region in order to better constrain its timing with respect to pre- and incipient-Tharsis tectonism.

***Methodology*:** In addition to stratigraphic mapping and defining unit contacts and polygons, graben in the mapping area were demarcated in ArcMap at a 1:1M scale using Thermal Emission Imaging System (THEMIS) Daytime IR basemap, supplemented by hi-resolution images taken by the Mars Reconnaissance Orbiter (MRO)'s Context Camera (CTX) and the Mars Express' High/Super Resolution Stereo Colour Imager (HRSC). Detailed mapping and assessment of the stratigraphic and crosscutting relations among the rock materials and structures are showing greater complexity that has been previously recognized.

Mapping: **Fig. 2** is our preliminary 1:1,000,000-scale geologic map of the Bathys Planum region of Mars. Below is a brief description of each mapped unit.

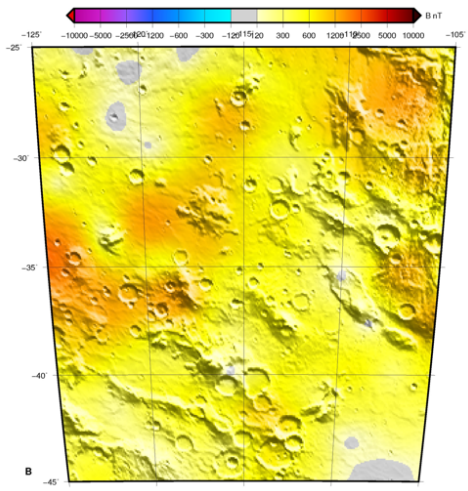


Fig. 1. Bathys Planum map quadrangle.

Early Noachian Unit: (eNh-light teal **Fig. 2**). These deposits consist of the heavily cratered highlands terrains. These units are found throughout the mapping area as a series of high-standing edifices which are often largely or completely embayed by later (Hesperian) lava flows.

Middle Noachian Unit: (mNh-dark teal **Fig. 2**). Intermediate aged highland unit consisting of heavily cratered-fractured terrain. In the southeastern section of the

mapping area, this unit is dominated by the presence of numerous gullies running perpendicular to the graben swarms.

Late Noachian Highland Unit: (lNh-light blue **Fig. 2**). These high-standing deposits are the smoothest and least-cratered of the highlands units and exhibit minor faulting. In the southwestern section of the mapping area, this unit is pronouncedly more weathered, possibly in part by fluvial activity which has also dissected softer Noachian-age crater fill.

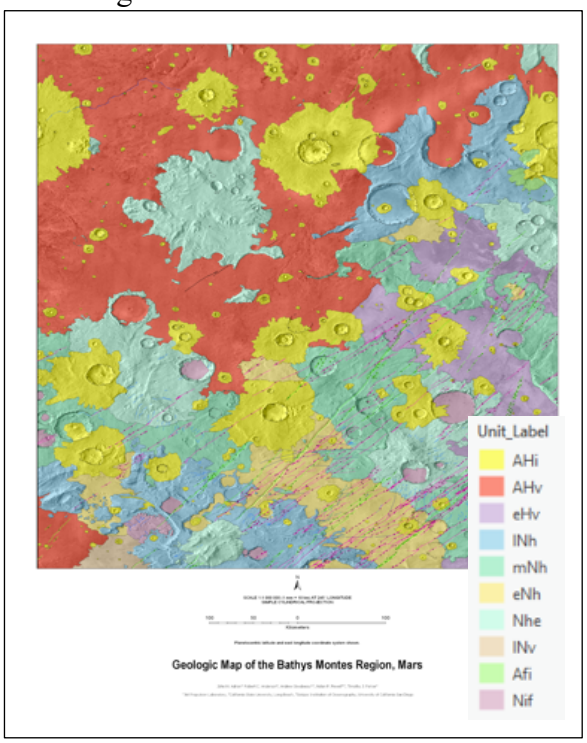
Early Hesperian Volcanic unit: (eHv-purple **Fig. 2**). This unit predates the older flows of Arsia Mons, is smooth but of variable IR albedo, and embays older highlands terrains. No preferred flow direction is observed, nor any particular volcanic vents were identified.

Amozonian-Hesperian Volcanic unit: (AHv-red **Fig. 2**). These flows constitute the southern margin of Daedalia Planum and the southern flank of Arsia Mons, and covers the northwestern half of the Bathys Montes area, where it onlaps eHv and eNh. They are texturally heterogeneous in IR but generally displays no clear lobate flow fronts or valleys, and no preferred direction of flow from a particular vent, except for a flow feature near the center of the mapping area.

Faulting: Two Fault Trends have been identified within this region (light green N40°W; and light pink N61°W in **Fig. 2**). Based on cross-cutting relationships, Fault System 1 (pink) appears to be the oldest set of faults for the Bathys region. These faults converge towards the Claritas Center identified by Anderson et al., [1] as a Stage 1 center. The younger fault system, Fault System 2 (green) cuts the Arsia Mons Hesperian Lavas. These faults converge towards the Pavonis Center identified as the Stage 3 center by Anderson et al., [1].

Preliminary Results: Geologic map shows early Noachian to Hesperian – Amazonian rock units. Two fault trends have been identified on **Fig. 2**:

- Oldest fault system projects to the Claritas Center.
- Youngest fault system points to the Pavonis Center.
- No Evidence has been seen to date to show ancient extension basin identified within the Terra Sirenum region.
- More work including crater counts of stratigraphic units is needed on age constraint the fault systems and ridges.



***References*:** [1] Anderson, R.C. et al. (2001) *JGR.*106, 20,563-20,585.

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