COMPARING VOLCANIC RESURFACING STYLES ON VENUS: RESULTS OF GEOLOGIC MAPPING STUDIES OF THE ISABELLA (V-50) AND DEVANA CHASMA (V-29) QUADRANGLES.

L.F. Bleamaster, III[1,2], [1]Planetary Science Institute, 1700 E. Ft. Lowell Rd., Suite 106, Tucson AZ, 85719; [2]Trinity University Geosciences Department, One Trinity Place #45, San Antonio TX, 78212; lbleamas@psi.edu

Introduction: The BAT (Beta-Atla-Themis) region on Venus is of particular interest with respect to evaluating global paradigms regarding Venus' geologic history, tectonic and thermal evolution, and resurfacing styles considering it is "ringed" by volcano-tectonic troughs (Parga, Hecate, and Devana Chasmata) and has an anomalously high-density of volcanic features with concentrations 2-4 times the global average [1]. The BAT is also spatially coincident with relatively "young terrain" as shown by Average Surface Model Ages (ASMA) [2, 3]. Of late, specific locations within and surrounding the BAT have been recognized as potential sites of active volcanism based on newly acquired VIRTIS emissivity data, geophysical modeling, and geologic mapping (Imdr Regio [4] and Shiwanokia Corona [5,6,7]).

Two 1:5 million-scale quadrangles, the Isabella (V50) and Devana Chasma (V29) (Figure 1), are located on opposite sides of the BAT region and present mapping provides a means to compare the styles and sequence of materials and processes that have occurred.

Data Sets & Methodology: Aiming to discover the types of processes that have shaped the Venusian surface, geologic mapping started with the demarcation of major structural and morphologic features (lava flow boundaries, shield fields and edifices, radial and concentric deformation zones) and followed with the formal delineation of geologic map units. Stratigraphic, embayment, and crosscutting relationships as well as crater morphology and crater halo degradation [8] are used to determine the relative ages of map units. All data used were acquired during NASA's Magellan mission (operational 1989-1994) and includes: Synthetic Aperture Radar (SAR; basemap provided by the US Geological Survey at 75 meter/pixel), altimetry and reflectance (~10 x 10 km footprint), and emissivity (~20 x 20 km footprint). Mapping is facilitated with the use of a georeferenced digital synthetic stereo (red-blue anaglyph, which merges SAR and altimetry). ESRI ArcGIS software is used along with a WACOM 21 inch interactive monitor and digitizing pen. Location features and linear features are mapped at a scale of 1:200,000; geo-contacts are mapped at a scale of 1:300,000. The accuracy of line work is controlled using streaming (500 map units) and snapping tolerances (250 map units). Upon completion of mapping, the geodatabase within ArcGIS will allow for efficient data analysis.

Devana Chasma: The V-29 quadrangle is situated over the northeastern apex of the Beta-Atla-Themis (BAT) region and includes the southern half of Beta Regio, the northern and transitional segments of the Devana Chasma complex, the northern reaches of Phoebe Regio, Hyndla and Nedolya tesserae, and several smaller volcano-tectonic centers and impact craters. Devana Chasma is a narrow (~150 km) 1000 km long segmented topographic trough (1-3 km deep with respect to the surrounding terrain) accommodating 3 to 9 kilometers of extension [9] and is one of three radiating arms of tectonic lineaments which trends south from Beta Regio. This topographic trough marks a physiographic divide (although discovered to be very subtle with respect to broad material units) between the relatively young Beta-Atla-Themis region to the west and the surrounding older highlands and plains to the east in Guinevere Planitia [abstract 1448, this issue]. Approximately midway down the map area from Beta Regio, Devana Chasma's lineament density decreases and changes trend to the southeast meeting with a north trending set of lineaments. This same mid-section is also marked by merging flows that emanate from volcanic centers located along the rift axis. Distinct relative timing markers are sparse, however when present, they often convey synchronous timing relations. Thus temporal constraints between the north and south lineament segments and(or) flows are mostly unconstrained, but relations likely indicate that propagation of the north and south segments overlapped in time and are now in a period of rift-tip linkage as the stress fields responsible for each segment merge [9].

Local resurfacing is dominated by flows from Beta Regio, Tuulikki Mons, and a number of small shield clusters. The east/west division is most clear with respect to tessera (dominant in the east; absent to the west) and the shield populations (the west, or region within the BAT, displays twice the spatial density of shields [10]). This could be related to elevated heat flow presumed to exist within the relatively youthful BAT region resulting in a greater number of isolated point source partial melts [11,12] being produced.

Isabella Quadrangle The V-50 quadrangle, in contrast, has very little tessera or highland material and is dominated by a regional plains unit that covers much of the area (blue unit). These regional plains continue to the south in the Barrymore Quadrangle V-59 [12] and extend to the north towards Parga Chasma (southeastern margin of the BAT). Additional coronae and small volcanic centers (paterae) contribute only to local resurfacing and a few flows from Imdr Regio spill into the quad in the southeastern corner. The flows from Imdr may correlate with the active resurfacing as proposed by Smrekar [4], but this is the only "recent" flow activity in the region. The remainder of V-29 is dominated by focused (Aditi and Sirona Dorsa) and distributed (penetrative north-south trending wrinkle ridges) contractional deformation and the formation of Isabella crater itself (northeast corner).

This marks a dramatic difference between the two regions despite their relative proximity to the BAT region and comparable ASMA ages. Although deformation, extension in Devana and contraction in Isabella are likely of very similar age - contraction in V-50 is oriented such that it is accommodating strain associated with stresses from Atla Regio and Parga Chamsa tension, which are likely contemporaneous with Devana rifting - the resurfacing histories are quite different due to the lithospheric conditions inferred from the deformation styles.

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Figure 1. *Isabella (V-50; left) and Devana Chasma (V-29; right) Quadrangles. Current map efforts will be presented including detailed descriptions and correlations of map units.*