EFFECTS OF CRUSTAL HETEROGENEITY ON THE SURFACE MANIFESTATION OF CHASMATA; A STUDY OF THE IX CHEL, KUANJA, VIR-AVA CHASMATA SYSTEM AND DEVANA CHASMA, VENUS. L.F. Bleamaster, III[1] and V.L. Hansen[1], [1]Department of Geological Sciences, Southern Methodist University, Dallas, TX 75275-0395.

Introduction: The Ix Chel, Kuanja, and Vir-Ava Chasmata (IKVC) collectively define a geographic division between the majority of Aphrodite Terra and Aino Planitia. Nearly 7000 kilometers in length, the IKVC separates the high standing tessera terrain of western, central, and eastern Ovda Regio and Thetis Regio from the low-lying southern "plains." Devana Chasma, located half way around the planet, likewise interacts with tessera terrain in Phoebe Regio. Devana Chasma is approximately 6000 kilometers long and bisects Phoebe Regio before fading into Navka Planitia. Local altimetry of the IKVC system and the Devana Chasma resemble that of other chasmata (i.e., Diana, Hectate, Parga, and Artemis), having continuous to discontinuous troughs with 3-6 kilometers of relief and 10-30° inward sloping walls; however, Magellan imagry reveals distinct surface morphologies and structural relationships warranting an in depth analysis.

Chasmata and Coronae: Chasmata or "rifts" are thought to develop in response to limited regional extension accompanied by diapiric upwelling resulting in coronae [1-3]. Hence, the two features (chasmata and coronae) have spatial distributions that are broadly correlated [4]. Of the 55,000 kilometers of Venusian chasmata, approximately 76% are found to positively correlate with the global distribution of coronae [5]. Given the statistically significant population of coronae in the Beta-Atla-Themis (BAT) region [4], including 128 coronae along Parga Chasma [6] and 46 along Hectate Chasma [7], many chasmata studies have trained focus on the coronae and their morphological differences [3,6-8], their spatial distributions [7,8], and the implications of their temporal significance [8,9]. This study, alternatively, focuses on chasmata that lack coronae in order to investigate possible crustal influences on chasmata morphology.

Study Area: Approximately 14,000 kilometers of Venusian chasmata are negatively correlated with coronae [4]. The greater part of this length is taken up in the IKVC (7000 km) and Devana Chamsa (~6,000 km). The IKVC contains only 4 coronae (Verdandi Corona {5°S, 065°E} and Inari Corona {17°S, 120°E} which mark the west and east extents of the IKVC, and two small unnamed coronae which lie off the main IKVC trace), whereas the Devana Chasma has no along track coronae and only a half dozen neighboring coronae (within ~200 km). Instead linear features, such as pit chains, troughs, normal faults, and fractures dominate the IKVC [10] and Devana. In fact many of the individual surface features, as well as the collective morphology resemble portions of Hectate Chasma, where two distinct surface patterns have been identified (diffuse fracturing morphology and trough-dominated morphology [7]); the principal difference being that the Hectate patterns are closely associated with coronae. It is the topographic similarities, the same types of linear feature suites, the ubiquitous presence of extensive volcanism, and the similar tectonic setting (limited extension) that begs the question; where are all the coronae at Devana and the IKVC?

Chasmata and Crustal Plateaus: One particularly striking difference about the IKVC and Devana Chasma, from those chasmata which are associated with coronae, is their close vicinity to crustal plateaus (Ovda and Thetis Regio, and Phoebe Regio, respectfully). Crustal plateaus are high-standing, steep-sided, flat-topped, quasi-circular regions of <u>thickened crust</u> [11,12]. This consequence, thickening and therefore strengthening, results in a two-fold mechanism for i) inhibiting coronae formation by increasing the layer through which a rising diapir must penetrate, and ii) affecting chasmata development by increasing the mechanical strength of those rocks subjected to tensional stresses.

Mapping: To date, detailed mapping using full-resolution SAR 2° x 2° tiles has been completed for the IKVC region and has been started in Devana. Preliminary findings support the hypothesis that crustal heterogeneities resulting from crustal plateau formation affects chasmata development. Along the southern boundary of Thetis Regio a series of east-west trending normal faults related to the formation of the IKVC has served to separate a portion of tessera from the main crustal plateau. This isolated patch of tessera outcrops on a small high-standing plateau (Iaso Planum) {12°S, 115°E} that is nearly surrounded by densely fractured chasmata. The isolated plateau has locally been volcanically flooded. The flows within Iaso Planum are relatively smooth and contain only a few east-west trending chasmata structures. It is envisioned that a combination of strength (provided by the underlying thick crust) and structural isolation (fault bound block) may have lead to the partitioning of strain around the plateau, much like ductile fabrics wrap around strong porphyroclasts in terrestrial metamorphic rocks.

Further to the west, flanking some of the deepest portions of Vir-Ava Chasma, two sets of structures indicate the presence of deep-seated diapirs unable to penetrate completely to the surface. Both sets, located on the southern flank (the planitia flank) of the chasma are consistent with strain associated with point source uplift. The first set {~18°S, 110°E} contains i) an arcuate set of cross fractures (or conjugate shear fractures [13]) and ii) extension fractures which consistently bisect the acute angle of the cross set. Although this pattern does not effectuate a full circle, extrapolation of the arc does place the center of deformation near a volcanic center located along the chasmata track. The second structure set {15.5°S, 105°E} consists of radial and concentric pit chains interpreted to be the surface manifestation of dikes at depth [10]. Again the set only creates a semi-circular pattern, but its center lies along the main chasmata track.

One other site along the IKVC is strongly indicative of upwelling material, but is not expressed at the surface as a corona. The Lo Shen Valles lava flows originate within the southern portion of Ovda Regio between the Kuanja ans Ix Chel Chasma sections {12°S, 089°E}. They are sourced from numerous ovoid depressions, caldera-like like structures and pit chains. Although void of any large volcanic edifices or radial/concentric structures, the flows are most likely the result of eruptions from a large magma chamber situated within the thickened crust of southern Ovda.

Conclusions: According to previous studies, coronae morphology and distribution are important factors for unraveling the mysteries of chasmata development. However, nearly one-fourth of all chasmata lack significant coronae development, therefore, alternative studies are required. Utilizing the highest resolution data available, structural mapping reveals relationships along some coronae-lacking chasmata that helps to resolve why they lack coronae. It appears that while chasmata formation mechanisms (limited extension and diapiric rise) are viable for the IKVC and Devana regions, mechanical heterogeneities, imparted to the crust by crustal plateau development, influence the morphologies of chasmata by the partitioning of strain and the impedance of diapiric rise. Therefore, these coronae-lacking chasmata provide us with additional clues about Venus' mantle dynamics and internal crustal structure.

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