Venus Equatorial Geologic Units D. A. Senske and J. W. Head, Department of Geological Sciences, Brown University, Providence, RI 02912.

Introduction The surface characteristics and morphology of the equatorial region of Venus were first described by Masursky *et al.*, (1980) (1) who showed this part of the planet to be characterized by two topographic provinces, rolling plains and highlands, and more recently by Schaber (1982) (2) who described and interpreted tectonic zones in the highlands. Senske and Head (1987,1988) (3,4) examined the distribution, characteristics, and deposits of individual volcanic features in the equatorial region, and in addition classified major equatorial physiographic and tectonic units on the basis of morphology, topography, and radar properties derived from PV data (5). In this abstract, we briefly describe the equatorial physiographic and tectonic units and examine the distribution, interrelationships, and patterns of these units.

Physiographic, Tectonic, and Volcanic Units Seven physiographic units have been mapped across the equatorial region of Venus (Fig. 1): inter-highland tectonic zones, tectonic junctions, upland plateaus, plains (undivided), dark halo plains, upland rises, and tectonically segmented linear highlands (previously called rifted highlands). The four latter units have been discussed previously (4). Inter-highland tectonic zones are linear to arcuate regions of elevated topography with lengths of hundreds to thousands of kilometers which rise typically 0.8-2.0 km above the surrounding plains. A central trough with flanking individual peaks or chains of mountains is commonly present (*e.g.* Dali Chasma, Ganis Chasma, Hecate Chasma, northern Ulfrun Regio, southern Devana Chasma, and Parga Chasma). In two locations, east of Atla Regio and adjacent to Phoebe Regio, a central trough is not evident. The inter-highland tectonic zones associated with Parga Chasma, Ganis Chasma, and Hecate Chasma have been interpreted to be associated with zones of extension (2) while Dali Chasma is suggested to be a site of crustal spreading (6). Map patterns show the inter-highland tectonic zones form a spoke-like pattern, converging at regions mapped as tectonic junctions. Tectonic junctions are radar-bright highlands located at the convergence of three or more inter-highland tectonic zones, and are centers of volcanism possessing individual mountains typically located at the crest of a domal topographic rise. Radar-bright lobate deposits located on the flanks of the peaks (*e.g.* Theia Mons) are interpreted to be lava flows. Features mapped as tectonic junctions include Beta Regio, Atla Regio, Asteria Regio, northern Phoebe Regio, the region of convergence of Ulfrun Regio and Hecate Chasma, and an elevated region southeast of Atla Regio (Fig 1). The largest tectonic junctions, located at Beta Regio and Atla Regio, have been interpreted to be associated with deep mantle thermal anomalies (7,8,9). The tectonic junctions located at Asteria Regio and northern Phoebe Regio possess characteristics similar to Beta and Atla, and may have formed in a similar manners, but are smaller. The combination of inter-highland tectonic zones and tectonic junctions forms an interconnecting network extending over half the circumference of the planet. Upland Plateaus are broad radar-bright to mottled-bright plateaus covering areas of hundreds of square kilometers, typically bounded by steep scarps standing 1 to 2 kilometers above the surrounding plains (5). Few individual peaks are present or they are entirely absent. Troughs similar to those associated with Beta, Atla, and Aphrodite are not observed. Specific upland plateaus are located north of Asteria Regio, on the eastern flanks of Beta Regio, at Phoebe Regio, adjacent to Ovda Regio and Thetis Regio, in the southern hemisphere at Alpha Regio, and at Tellus Regio (Fig. 1). Venera imaging of Tellus Regio shows it to possess a complex tectonic structure of intersecting valleys and ridges and is mapped as tessera (10). A comparison of radar properties indicate that both upland plateaus and tessera are characterized by high roughness and low uncorrected reflectivity, and that they contain a large percentage of wavelength-scale (5-50 cm) diffuse scatterers (11). On the basis of topographic signature, radar properties, and the correlations with units mapped as tessera from Venera imaging, it is suggested that areas mapped as upland plateaus are tectonic units similar to tessera (5).

In addition to the physiographic units, features interpreted as coronae and volcanic mountains have also been mapped (5). Five structures interpreted to be coronae are observed in the PV image data, two of which are located in the overlap region with Venera data (5). These features have diameters ranging from 210 km to 840 km, correlate with local areas of elevated topography, are characterized by a narrow, typically discontinuous radar-bright ring, and are concentrated in the vicinity of Eisila Regio and Bell Regio. We find the number of corona per unit area to be much less in the equatorial region than in the northern high latitudes (12,13).

The presence of volcanic mountains in the equatorial region has been established from high resolution Arecibo imaging (14). On the basis of the presence of lobate flow-like features and structures interpreted to be summit calderas (*e.g.* Sappho and Sif Mons) (5), fourteen volcanic mountains have also been mapped from lower resolution PV image data (4). In addition, approximately 55 mountains inferred to be volcanic on the basis of the presence of radar-bright deposits interpreted to be systems of lava flows along with possessing properties similar to volcanic peaks in the region of overlap between PV and Venera imaging have also been mapped. From this analysis it is observed that the density and total number of large volcanic peaks in the equatorial region is greater than that in the northern high latitudes.

Conclusions The highlands in the equatorial region of Venus form a near-global network of volcanic centers and interconnecting tectonic zones, composed of several distinctive terrain types. The relationship between tectonic junctions and inter-highland tectonic zones suggests that the junctions are nodal points of the network. The inter-highland tectonic zones which extend to the north and do not connect with tectonic junctions die out in this direction. In some places in the equatorial network crustal spreading may be occurring (inter-highland tectonic zones) (6) whereas at other places (tectonic junctions) hot spots and thermal uplift activity is apparently occurring. These characteristics and correlations suggest that both vertical thermal uplift and lateral movement are occurring in the Venus equatorial highlands.

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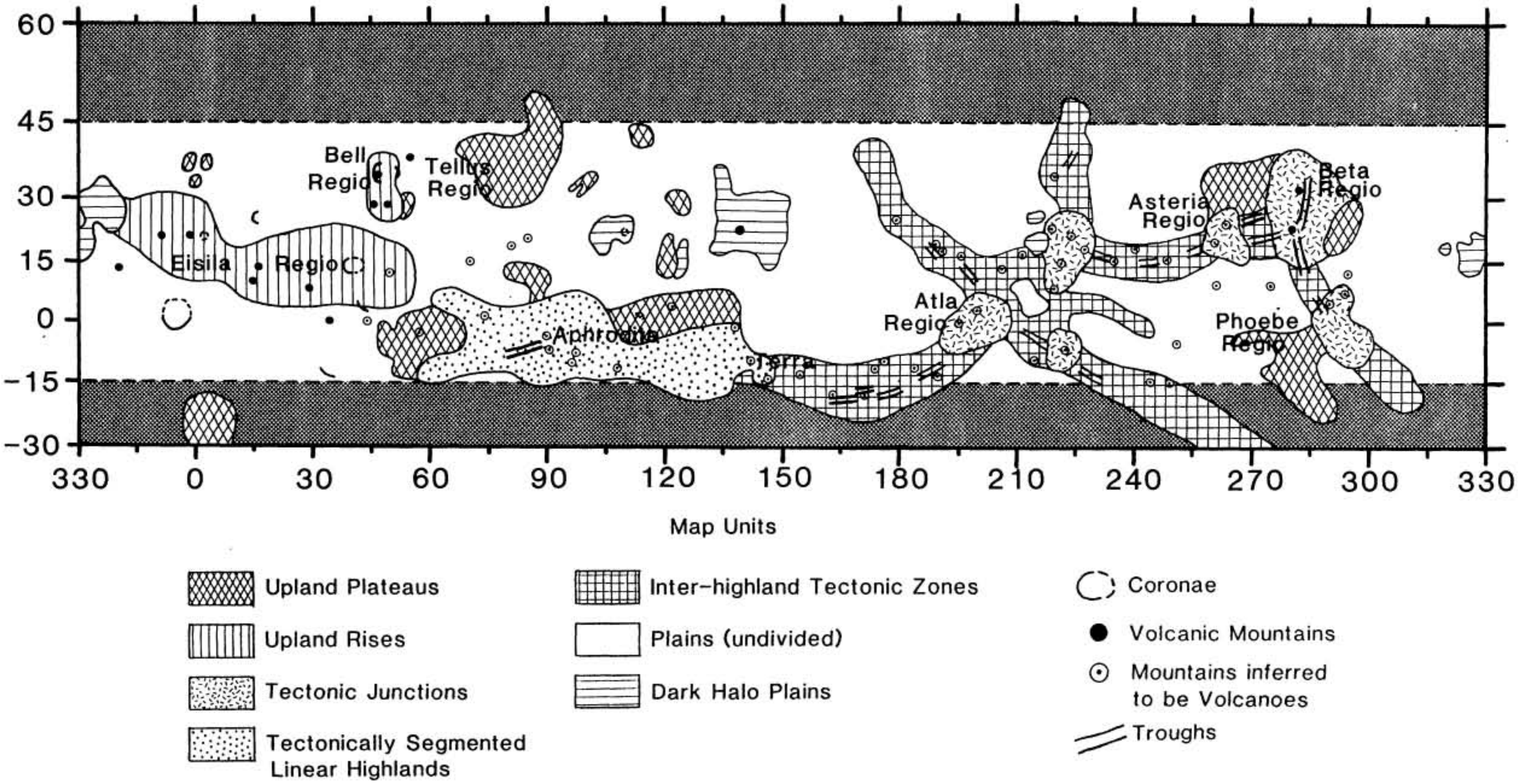

Figure 1. Geologic units mapped in the equatorial region of Venus. The units are described in the text and in Senske and Head (1988) (4). The grey regions correspond to areas outside of the PV image.

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