TWO POSSIBLE SUBDUCTION ZONES ON VENUS, Sharon L. Frank and James W. Head, Brown University, Providence RI, 02912.

Of the ridge belts defined from Venera 15/16 images,[1] four lie in topographic troughs, leading to debate over the origin of these features; are they zones of extension and rifting,[2,3] or compression and subduction?[4,5] We examine two of these ridge belts, Ausra and Lukelong Dorsae, and conclude that both regions are candidates for major contraction and subduction.

Ausra Dorsa (45-55°N, 20-28°E), ranging from 100 to 200 km in width, lies southeast of Maxwell Montes and Fortuna Tessera, and is concentrated mostly in a linear topographic low. Most of the ridge belt lies in a trough 0.5-1.5 km below the surrounding plains. Within the trough occurs a series of parallel to anastomosing ridges with a central ridge sometimes in excess of 500 m high (Fig. 1a-c). The ridge belt makes a distinctive bend toward the north in the central part of the map region and this bend area is characterized by a local topographic high in the trough. To the north of the ridge belt, a groove belt[1,6] with a large (200 km diameter) volcano is parallel to the southern leg of Ausra. A zone of small domes, similar to shield volcanoes[7,8] parallels the northern part of Ausra about 150 km to the west (Fig. 1a). Laima Tessera is located several hundred km to the east of Ausra, and blocks of tessera and partly flooded tessera are abundant. Ridges and lineaments in plains adjacent to the tessera and parallel to the linear fabric of the tessera may indicate that tessera underlies the plains between Ausra and Laima, particularly in the region to the SE characterized by higher tessera-like topography. The presence of the tessera may be linked to the change in strike of the ridge belt. The trough associated with Ausra could have been formed by either extension and rifting,[2,3] or compression, underthrusting and subduction. The ridge-like morphology of the deformation features in Ausra is in contrast to the scarp-like features seen in the Devana Chasma rift in Beta Regio;[9] Ausra contains a central ridge of high topography, and there is no evidence for a broad thermal rise that should be associated with extension and thinning. On the basis of the ridge-like morphology of the structural elements, their sinuosity, the occurrence within a depression, and the central ridge of apparent deformational origin, we interpret Ausra to be of compressional origin, with the trough representing a zone of flexure and underthrusting, and the ridges and central ridge representing deformation and imbrication of crustal material during the underthrusting process. The presence of the trough suggests that there is more significant shortening than associated with mare-ridge-like ridge belts,[10] and we believe that Ausra is a candidate for a subduction zone.

Lukelong Dorsa (68-73°N, 180-185°E), a ridge belt with a broad, concave-west arc, lies in a long, narrow trough (600 km long and 80-100 km wide) which is up to 1 km deep (Fig. 2a-c). The general cross-sectional nature of Lukelong is similar to Ausra with a central ridge and associated smaller ridges (compare 1c and 2c). In detail from W-E in the ridge belt, one observes a steep, east-dipping scarp, small ridges, a broad ridge, and a gradual west-dipping slope with an arch at the crest (Fig. 2).[4] Plains of apparent volcanic origin characterize the areas to the E and W of Lukelong. On the basis of these characteristics, their similarity to Ausra Dorsa, and their contrast to known rift zones like Beta Regio,[9] Lukelong is interpreted to be of compressional origin. The broad arch along the east flank is interpreted to be flexural in nature, and the concave-west curvature, steep western boundary and gradual eastern boundary are best explained by a west-dipping zone of underthrusting and possible subduction.

Zones of convergence and underthrusting in parts of Ishtar Terra (Maxwell, Ut, and Freyja Montes) are characterized by formation of mountain belts and crustal thickening. In the case of Lukelong and Ausra, there is little topographic evidence of crustal thickening in the direction of underthrusting, suggesting that if these are in fact subduction zones, the underthrust material is dipping at relatively steep angles. A detailed investigation of zones such as Lukelong and Ausra Dorsa with gravity data and high-resolution altimetry data will help to identify flexural bulges and signatures associated with various models of underthrusting and subduction at depth.

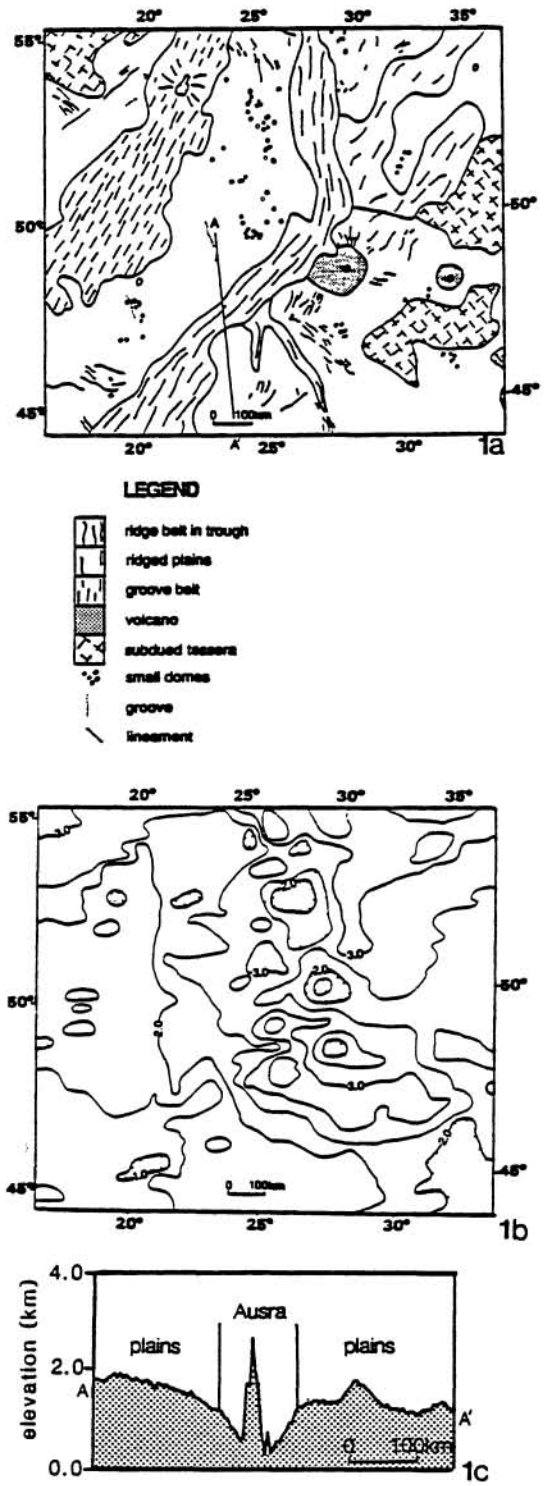

Figure 1. Ausra Dorsa. **a.** Sketch map. **b.** Topographic map from Venera 15/16. Contour interval is 0.5 km. **c.** Doppler-sharpened Venera 15/16 topographic profile from A to A' in (a). Vertical exaggeration = 75X.

References

1) Barsukov et al., *PLPSC 16th*, D378-D398, 1986. 2) Sukhanov and Pronin, (in Russian), *Doklady AN SSSR, 294*, 661-665, 1987. 3) Sukhanov and Pronin, *PLPSC 19th*, 335-348, 1989. 4) Frank and Head, *LPSC 20th*, 309-310, 1989. 5) Frank and Head, Ridge belts on Venus: Morphology and Origin, manuscript to be submitted to *JGR*, 1990. 6) Basilevsky et al., *Proc. LPSC 16th*, D399-D411, 1986. 7) Aubele, *LPSC 19th*, 21-22, 1988. 8) Aubele, *LPSC 20th*, 29-30, 1989. 9) Stofan et al., *GSA Bull, 101*, 143-156, 1989. 10) Frank and Head, *LPSC 21st*, this volume, 1990.

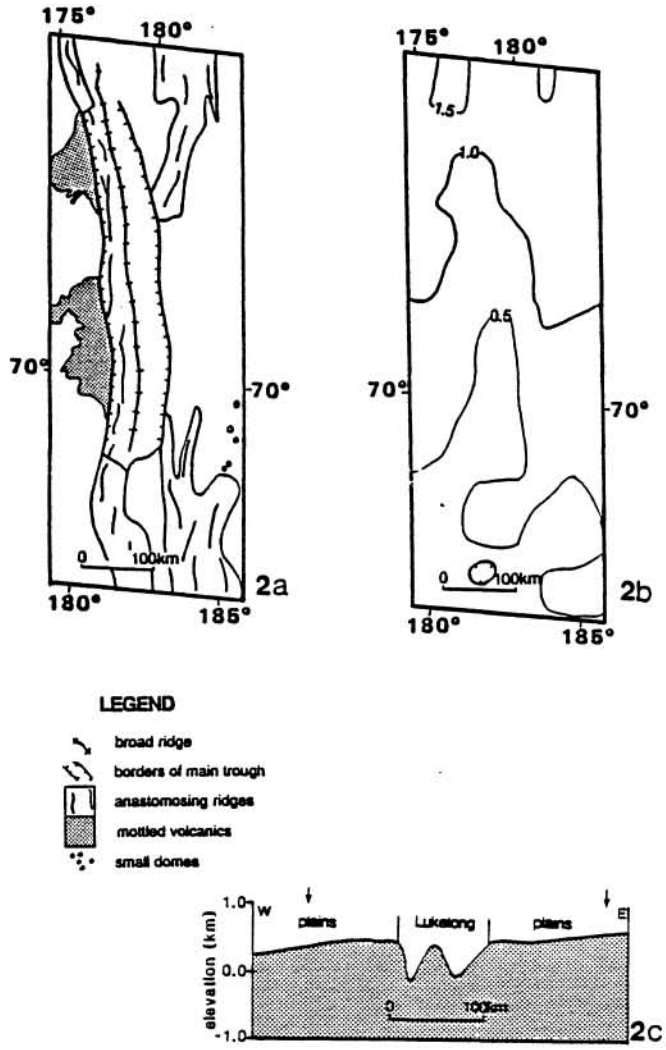

Figure 2. Lukelong Dorsa. **a.** Sketch map. **b.** Topographic map from Venera 15/16. Contour interval is 0.5 km. **c.** Generalized topographic section across Lukelong. Arrows are at edges of maps in (a) and (b). From Venera 15/16 contour map, doppler sharpened profiles, and image.