LUKELONG DORSA AS A ZONE OF UNDERTHRUSTING AND POSSIBLE SUBDUCTION ON VENUS. Sharon L. Frank and James W. Head, Dept. of Geological Sciences, Brown University, Providence, RI 02912.

Ridge belts on Venus, first noted by Barsukov, *et al* (1) in the radar images from Venera 15/16, were originally interpreted to be compressional structures (1,2), and we have provided additional evidence for a compressional origin (6). In addition, Sukhanov & Pronin (3,4,5) have proposed that they represent extensional features resembling spreading features on Earth. One argument for an extensional origin (3,5) is that the location of a few ridge belts in linear topographic depressions is inconsistent with a compressional origin. However, as discussed earlier (6), several mechanisms including flexure and folding can explain compressional features in topographic lows, but the most likely explanation is large-scale underthrusting. Here we examine the hypothesis that Lukelong Dorsa, a distinctive negative ridge belt, is a zone of underthrusting and possible subduction.

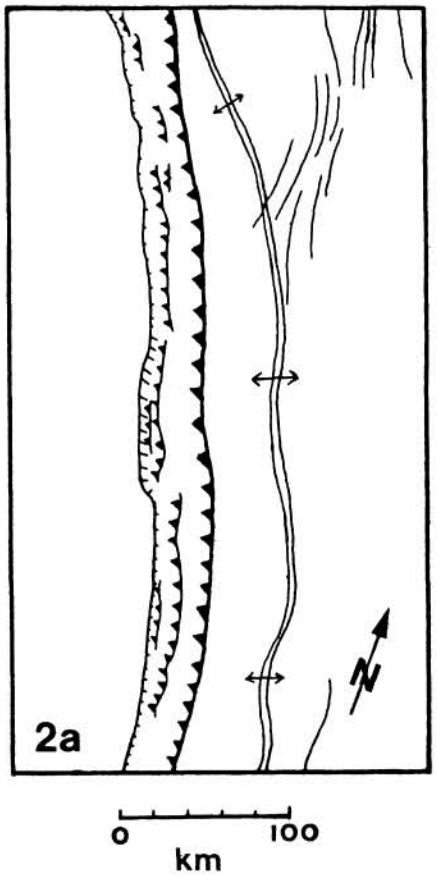
Lukelong Dorsa, located on the western edge of the Plains-Ridge Belt assemblage (7), is a ridge belt which lies in a trough up to 1.5 km deep, 80-100 km wide and about 600 km long. The belt forms a broad, concave-west arc, and is surrounded on the east and west by plains (Fig. 1). The boundary between the plains and belt is abrupt in the west, with a steep scarp in the central section, while the eastern boundary is less distinct, with a broad arch (10-20 km wide) in the center. In the center of the trough, a broad arch 10-15 km wide and up to 0.5 km high extends the entire length of the trough, and to the west of this smaller ridges are visible. In summary, a transect from west to east shows a plains region, a steep, east-dipping scarp, a small ridge, an arch, a gradual west-dipping slope with an arch at the crest, and more plains.

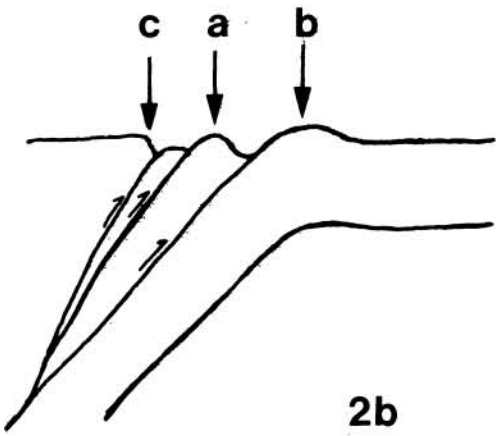
The asymmetry and arcuate structure of this belt suggest a compressional origin (6). Fig. 2 illustrates our interpretation of this region, with the underthrust crust dipping to the west, and the major fault located under the central arch. This direction of dip is based on the concavity of the arc to the west, as the upper plate in a thrust fault is generally concave in the direction of dip, and on the abrupt boundary to the west (a reverse fault) and gradually sloping boundary to the east (a possible flexural rise). The broad arch near the axis of the trough could represent either the accumulation of unconsolidated materials at the thrust front, or a large imbricate thrust slice, as depicted in Fig. 2. As shown, the ridges to the east are also the result of imbricate faulting. The plains ridges strike into the rise and fault zone, but do not appear to be structurally linked to Lukelong, suggesting that they may be a passive part of the underthrusting crust.

The main question here is whether underthrusting and subduction could cause the observed structure. The thermal and crustal structure of Venus (6) are such that a brittle upper crust may be separated from a brittle upper mantle by a ductile lower crust, which provides a decollement along which crustal detachment and imbrication might take place. In this case, crustal shortening and large scale underthrusting would result in detachment and imbrication of the brittle upper layer along this zone of weakness. The thickness of this upper layer is related to several factors, including its mode of formation, evolution, and local thermal structure. We are presently examining other parts of Lukelong Dorsa in an attempt to determine the amount of shortening involved, the thickness of other possible imbricate layers, and evidence for actual subduction and crustal loss.

References: (1) Barsukov *et al* (1986) *JGR 91*, D378-D398. (2) Basilevsky *et al*, (1986) *JGR 91,* D399-D411. (3) Sukhanov (1987) *LPSC XVIII*, 974-975. (4) Sukhanov & Pronin (1988)*LPSC XIX*, 1143-1144. (5) Sukhanov & Pronin (1989) *Proc. LPSC XIX* (in press). (6) Frank & Head (1988) *LPSC XIX*, 350-351. (7) Head (1989) *LPSC XX* (this volume). (8) Zuber (1987) *Proc. LPSC XVII,* E541-E551.

Fig. 1: Venera 15/16 image of Lukelong Dorsa. Center is at 77°N, 180°E. Letters are as follows: **a** is central arch; **b** is eastern boundary; **c** is western scarp.





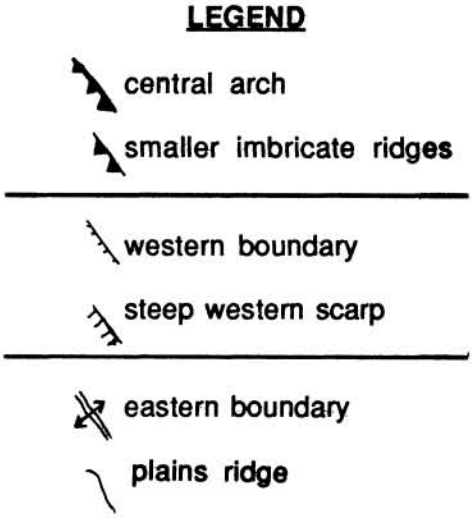


Fig. 2: Interpretation of Lukelong Dorsa. **a**: Tectonic map. **b**: Interpretive cross-section. Letters same as Fig. 1.