LARGE-SCALE LATERAL MOVEMENT AND CONVERGENCE OF CRUSTAL MATERIAL ON VENUS: EVIDENCE FROM MAXWELL MONTES AND FORTUNA TESSERA. **R.W. Vorder Bruegge and J.W. Head, Dept. of Geo. Sci., Brown Univ., Providence, RI 02912.**

Introduction: Ishtar Terra displays evidence of extensive tectonic deformation (1, 2, 3), including linear mountain belts (3 to 4 km above mpr). Maxwell Montes, to the east of Lakshmi Planum, (altitude of 12 km) is characterized by long, linear, parallel ridges and valleys which have been interpreted as compressional in origin (1, 4). To the east of Maxwell Montes is a 2 to 5 km-high plateau area known as Fortuna Tessera. Tessera is terrain which exhibits intersecting ridges with a variety of complex, angular relationships (5). Although mapped as distinct units (2,5), detailed mapping shows a transition in morphology between Maxwell Montes and Fortuna Tessera. In this paper, we investigate the relationshops between the two regions.

Previous Work: On the basis of mapping and interpretation of Arecibo and Venera images and P/V topography data, a model for the formation and evolution of Maxwell Montes has been proposed (6,7). In this model, 1) proto-Maxwell Montes initially underwent compressional deformation in an approximately E-W direction, resulting in the initiation of an Akna Montes-like, long, linear orogenic mountain belt (8) to the east of its present location; 2) continued compressional deformation and westward transport between two converging shear zones resulted in continued growth of the orogenic belt, and a reorientation of the maximum compressive stress direction to a north-south configuration, due to continuing constriction between the bounding shear zones; 3) in the latter stages of the tectonic transport, the reoriented stresses favored a regime in which right-lateral strike-slip faults formed in a northwest-southeast orientation. Right-lateral offsets between 20 to 120 km occurred along these faults as the growing orogenic belt was transported west and further wedged between the converging shear zones. A terrestrial analog of strike-slip faulting between transform faults has been discussed for the Gorda Block of the Juan de Fuca plate (9). In the Maxwell Montes case, lateral transport of crustal materials over distances of 1000 km or more are implied by the geometry of the present and reconstructed mountain range (7). Such intense deformation and transport implies that the region involved in the deformational processes must be more extensive, particularly from the direction of tectonic transport to the east. Therefore, this study focuses on the nature of Fortuna Tessera and the transition between the two terrains.

Fortuna Tessera Units: The general geomorphic-tectonic unit map (Fig. 1) complements the geological-morphological map compiled by Soviet investigators (5), and shows the distribution of the following units: *Arcuate-Ridged Tessera* : Short-to-intermediate length (50 to 200 km) parallel ridges which strike in approximately the same direction as the ridges on Maxwell Montes, and have a similar morphology and interpreted origin. This ridge unit, though, tends to broadly wrap around Maxwell Montes and lies on a broad plateau at an elevation between Maxwell and the area to the east. *Chevron Tessera* : Characterized on a small scale by a typical tessera-like pattern of intersecting ridges with a variety of complex, angular relationships. On a larger scale, this unit is characterized by a very high level of disruption and large chevron-like features hundreds of kilometers across, giving the region a highly buckled appearance. *Normal Tessera* : In the easternmost region, the pattern is similar to that of typical tessera areas - intersecting ridges which meet at a variety of angles from acute to orthogonal (3). *Ridge Belt* : This unit is characterized by arcuate to sinuous ridges up to 200 km in length which occur in a long, linear belt. It is similar in size, ridge-spacing, and overall appearance to other ridge belts observed in the plains of Venus (2). This ridge belt occurs along the edge of the plateau and may be linked to compressional deformation in a direction normal to its strike. *Plumose Ridges* : This unit occurs to the south and consists mostly of very narrow ridges (less than 5 km wide) which fan away from the areas of most intense deformation in the chevron tessera and the arcuate-ridged tessera to the north.

Observations: 1) the central region (chevron tessera) appears to be the most complexly deformed area, possibly originating as more normal tessera, and deforming to its present configuration by having undergone shortening and buckling. On the basis of the reconstruction of Maxwell Montes (7), proto-Maxwell originated within the present area of this unit (see star in Figure 1). 2) the eastern area (normal tessera), although structurally complex, is very similar to tessera units mapped elsewhere in the northern hemisphere (3). 3) the near-parallel orientation of ridges in the arcuate-ridged tessera to those in the adjacent Maxwell

Montes, and the wraparound appearance of this terrain around Maxwell, strongly suggest similar deformational styles and a close tectonic link. 4) convergence of the plumose ridges at the boundary between arcuate-ridged tessera and chevron tessera suggests a focal point for deformation at that apex. 5) the scale and orientation of the ridge belt at the northwestern boundary suggests that some compressional deformation between the northern plains and the highly deformed area to the southeast is focused in that region.

Conclusions: 1) There appear to be three major and distinctive tectonic zones in the Fortuna Tessera region; a) Maxwell Montes/Arcuate-Ridged Tessera, b) Chevron Tessera, and c) Normal Tessera. 2) The most intensive deformation appears to be focused in the central Chevron Tessera, between the least deformed Normal Tessera to the east, and the complexly deformed Maxwell Montes/Arcuate-Ridged Tessera to the west. 3) According to the retrodeformation and paleoreconstructions of proto-Maxwell Montes (6, 7), proto-Maxwell originated in the middle of the area that is now Chevron Tessera. 4) On the basis of these observations, we conclude that the geological and tectonic characteristics of the Fortuna Tessera region are closely linked to the deformational history interpreted for Maxwell Montes (7), and that the detailed characteristics of the mapped units (Figure 1) are caused by large-scale convergence and horizontal compressional deformation distributed over about 3×10^6 km^2 of the surface of Venus. The regional tectonic patterns are consistent with an east to west direction of tectonic transport, as inferred previously from analysis of Maxwell Montes alone (7). Accompanying this east-west transport, deformation occurring just east of Maxwell produced the wrap-around structure in the arcuate-ridged tessera, and flanking deformation occurring adjacent to the shear zones bounding Maxwell Montes and the boundaries of the Chevron Tessera produced the fanning ridges to the south and the sinuous ridge belt to the north. In another study, we correlate these mapped units with topography to assess the implications of surface deformation patterns for crustal and lithospheric processes (10).

References: 1) D.B. Campbell *et al.*, (1983) *Science, 221,* 644. 2) V.L. Barsukov *et al.*, (1986) *J. G. R., 91,* 378. 3) A.T. Basilevsky *et al.*, (1986) *J. G. R., 91,* 401. 4) S.C. Solomon and J.W. Head, (1984) *J. G. R., 89,* 6885. 5) A.L. Sukhanov *et al.*, (1986) *Astronomichesski Vestnik, XX,* 99. 6) R.W. Vorder Bruegge *et al.*, (1986) *LPSC XVII,* 917 (abs.). 7) R.W. Vorder Bruegge *et al.*, (1987) *LPSC XVIII,* 1047 (abs.). 8) L.S. Crumpler *et al.*, (1986) *Geology, 14,* 1031. 9) P.R. Stoddard (1987) *J.G.R., 92,* 11524. 10) R.W. Vorder Bruegge and J.W. Head (1988) *LPSC XIX* (This Volume).

Figure 1. Geomorphic-Tectonic Map of Maxwell Montes and Fortuna Tessera. Units are described in text. Star indicates approximate location of proto-Maxwell Montes, derived from the geometry of the shear zones.

1)