

## SPACING OF RIDGE BELTS IN THE PLAINS-RIDGE BELT ASSEMBLAGE:

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**Introduction:** Ridge belts, first identified in the Venera 15/16 images (1,2) are a common tectonic feature in northern Venus. Between 0°E and 90°E in the Tessera-Ridge Belt assemblage (3), the ridge belts form an orthogonal pattern surrounding large blocks of tesserae, while in the Plains-Ridge Belt assemblage, between 150°E and 250°E, the belts trend predominantly N-S, occasionally coalescing and dividing to form a fan pattern (Fig. 1) (3,4). The origin of these ridge belts is a matter of controversy, with both compressional origins (2,5) and extensional origins (6,7,8) proposed. We have measured the spacing of the ridge belts in the fan region and present the data here, with some preliminary applications to the mode of formation of these belts.

**Approach:** We first outlined the extent of the ridge belts in the fan area, and defined the center crest of each belt. In places where two belts merge to form a wider belt and then separate again, we defined the crest of each through-going belt separately to retain the continuity of the belts. Where two belts merge into one and form a belt about the same width as the widest of the two belts, each belt was considered to be separate until the two belts coalesce, at which point only the crest of the most prominent belt was considered. The distance between crests was then measured along lines of latitude at 2.5° intervals. The average spacings were determined as a function of latitude and longitude, and compared with the width of the fan and the number of belts with latitude.

**Results:** The data are summarized in Figs. 2-4. Fig. 2 shows that the spacing of belts is clustered between 300 and 450 km, and the spacings are skewed towards the longer wavelengths. The average value of these 60 measurements is 393 km, with a standard deviation of 138 km. This value is higher than the 300 km obtained earlier (9), using only the western-most belts. The number of belts and the width of the fan both decrease from 50°N to 80°N (Fig. 3), as one would expect from the fan pattern. However, the fan shape is probably not strictly due to more ridge belts, as the spacing between belts also appears to increase towards lower latitudes (Fig. 4a) with a correlation coefficient for the best-fit line of -0.63. The major deviant from this trend is the southernmost point. This point is also anomalous because, as shown in Fig. 3, south of 50°N the fan pattern no longer increases in width or number of ridge belts, and belts become less well defined as one moves south from 50°N. Therefore, when we eliminate this anomalous data, the trend is much clearer, and has a correlation coefficient of -0.89. Fig. 4b shows a possible increase in spacing to the east in the fan, with a correlation coefficient of 0.70.

**Discussion and Conclusions:** These data add constraints to the origin of the fan of belts; any model which relates to the formation of the ridge belts must explain the apparent increase in spacing to the south and east in this assemblage. The regular spacing of the belts observed by Zuber (9) is confirmed, but the spacing is larger than she observed, and several belts have a much larger spacing. This regularity of spacing has been explained by unstable compression or extension of the venusian lithosphere (9), and by elastic buckling (10). The variation in spacing observed here could be due to inhomogeneities in the crustal thickness, as Zuber (11) has shown that the crustal thickness, and thus the isostatic elevation, could affect the wavelength of the ridge belts under either extension or compression. However, while some topographic variation exists locally within this assemblage (~2 km overall), there is no distinct trend in topography. Higher resolution topography may show a trend which could explain the observations above. The other proposed origin which can be addressed using these data is the spreading model (6,7,8). Sukhanov & Pronin argue that all of the ridges belts in the Plains-Ridge Belt assemblage were formed by extension, and cite three possible models by which this may have occurred (8). Of these, the one that can be addressed with the data presented here is that in which spreading has occurred down the middle of the region, splitting Metis and Atalanta apart (6,8). If this is the case, the above data show that the spreading was more rapid in the south, resulting in larger spacing, and perhaps has been active for longer there to produce more belts. Furthermore, if the increase in spacing to the east is a true trend, the spreading would have to be asymmetric over a long period of time. We are presently studying the morphology and structure of these belts in order to test these hypotheses further.

**References:** (1) Barsukov, *et al* (1986) *JGR* 91, D378-D398. (2) Basilevsky, *et al* (1986) *JGR* 91, D399-D411. (3) Head (1989) *LPSC XX* (this volume). (4) Frank & Head (1988) *LPSC XIX*, 348-349. (5) Frank & Head (1988) *LPSC XIX*, 350-351. (6) Sukhanov (1987) *LPSC XVIII*, 974-975. (7) Sukhanov & Pronin (1988) *LPSC XIX*, 1143-1144. (8) Sukhanov & Pronin (1989) *Proc. LPSC XIX* (in press). (9) Zuber (1987) *Proc. LPSC XVII*, E541-E551. (10) Banerdt & Golombek (1988) *JGR* 93, 4759-4772. (11) Zuber (1987) *LPSC XVIII*, 1140-1141.

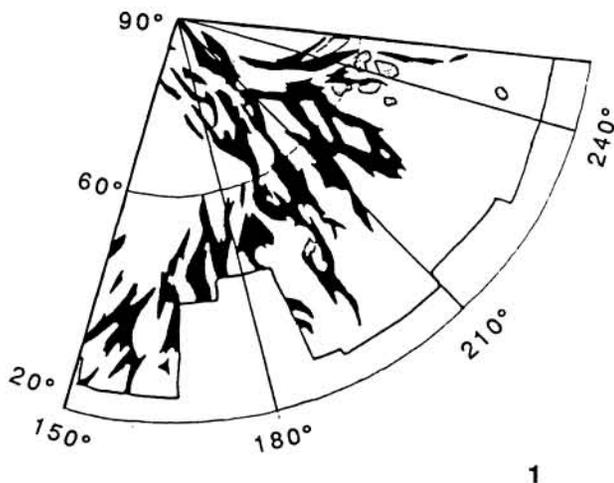


Fig. 1: Ridge belts in Plains-Ridge Belt assemblage.

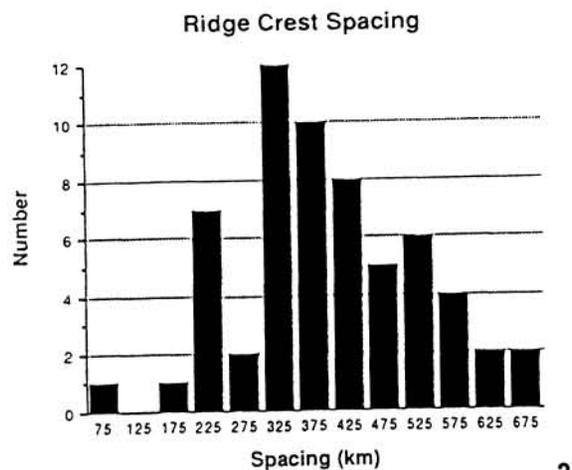


Fig. 2: Histogram of ridge crest spacing in Plains Ridge Belt assemblage.

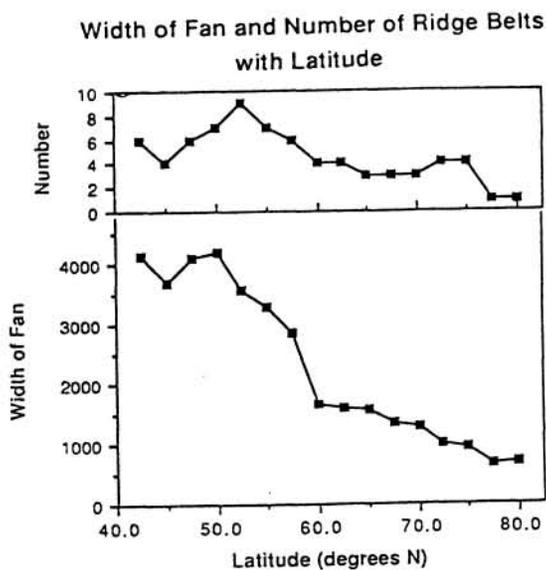
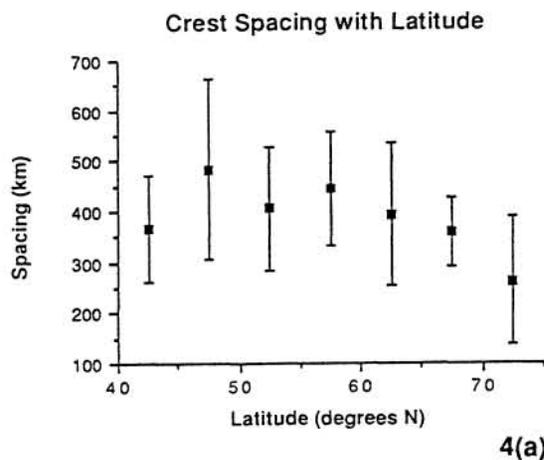
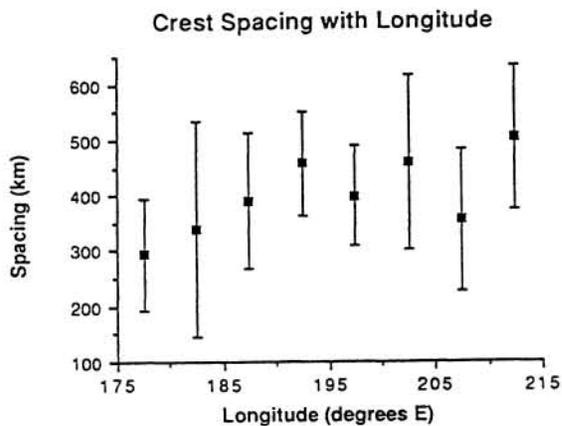


Fig. 3: Width of fan and number of ridge belts as a function of latitude. (South of 50°N there are large gaps in the data. The width measurements include the width of this gap, but the number of ridge belts is that only in the regions for which there is coverage.)

Fig. 4: (a) Crest spacing as a function of latitude. (b) Crest spacing as a function longitude. Error bars represent  $\pm 1$  standard deviation



4(a)



4(b)