THE RESULTS OF MORPHOMETRIC STUDY OF THE TESSERA TERRAIN OF VENUS FROM VENERA 15/16 DATA.

N.A. Ivanov. Vernadsky Inst., Acad. Sci. USSR, Moscow, 117975, Kosygin St., 19

The tessera (parquet) terrain on Venus has a unique deformational morphology dominated by cross-cutting ridges and grooves and described in detail in /1/. Tesserae being the vast zones of areal tectonic deformation occupy about $9 \cdot 10^6$ km^2 of the $130 \cdot 10^6$ km^2 area surveyed by Venera 15/16 SAR. Within the zone of Venera 15/16 survey there are several large areas and small patches of tesserae surrounded by lava plains. The tesserae are different in the structural pattern and in the distance between the adjacent ridges and grooves (spacing).

The purpose of this work is to measure the spacing aiming to estimate the thickness of a deformed layer assuming to that the deformations were within the brittle layer overlying some ductile material /2/.

Computer-made photomaps of 1:4 000 000 scale with the altitude contour-lines were used for the study. The locations of the tesserae under study are shown in Fig. 1. The work fulfilled includes the outlining of the ridges, the measuremens of the crest to crest distances between them and the subsequent statistical treatment. For lagre tesserae the sracing was measured using the running window technique along the latitudinal and longitudinal profiles following along 20°E and 70°N and 50°E and 52°30'N for Fortuna tessera and Laima tessera, respectively. For small tesserae the measurements were made all over the area of the tesserae. Within every area under study several cross-secting subparallel systems of ridges were distinguished. The spacing was measured for every of them and weighting average value was calculated. The average height of every area under study above the datum was measured and refferred to the center of the area (window).

As can be seen from Fig. 2 there are dependence between the tesserae sizes and heights and their spacing: the larger tessera, the larger its spacig and height are. The co-variation of spacing and height of tesserae can be seen from Fig. 3. These trends are clear when the different tesserae are compared, while within the different parts of individual tessera such trends are very weak or do not exist.

The morphology of tesserae provides evidences of the extentional conditions during their formation /1/. And that's why we may use the method /3/ for estimating the thickness of the brittel layer. Assuming Young's modulus $E = 10^{11}$ dyne/cm^2; Poisson's koefficient $\nu = 0.25$; $g = 887$ cm/s^2; $\rho = 3\text{-}3.5$ g/cm^3 the calculations give the thickness range of 1 to 3 km for different tesserae for imbricate faulting model. In the case of the horst-graben model, the estimated thickness of the layer is 0.5-1 km.

All the tesserae observed are characterized by elevation in topography. Because of slow erosion rate and present high temperature a decreasing of topograhy seems to be produced mostly from gravitational relaxation /4/ providing the forces for deformations. There are at least two reasons for high elevation of tesserae - dynamic support or static buoyancy. The absence of a prominent gravity anomalies over the Tellus Regio tessera /5/ can be considered as an argument against the dynamic support at least for this case. Thus, the buoyancy case seems to be reasonable. In this case two speculations are equal. 1) Venera landers' data /6/ and surface morphology /7/ point to basaltic composition of the plains. Thus, the topography of tesserae may be due to tectonic piling of basaltic layer. 2) The material of tesserae is lighter than the basalt and represented by some fedspathic material like syenite, granite, etc.

In the first case assuming the density of basalt 3 g/cm^3 and the underlying layer (olivine mantle /2/) from 3.2 to 3.3 g/cm^3 the depth of the mountains roots will be 30-45 km for Fortuna tessera, 20-30 km for Laima tessera and 10-15 km for small tesserae.

In the second case the low density may be due to the feldspathic crust /8/. If the density of crustal blocks is 2.5-2.7 g/cm^3 and the supporting material will be basalt (density is 3.0 g/cm^3) the depth of the roofs will be 15-27 km, 10-18 km and 5-9 km for Fortuna, Laima and small tesserae, respectively. These data put some constraints on the thickness of "geochemical" crust on Venus.

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The results of morfometric study.

M.A.Ivanov

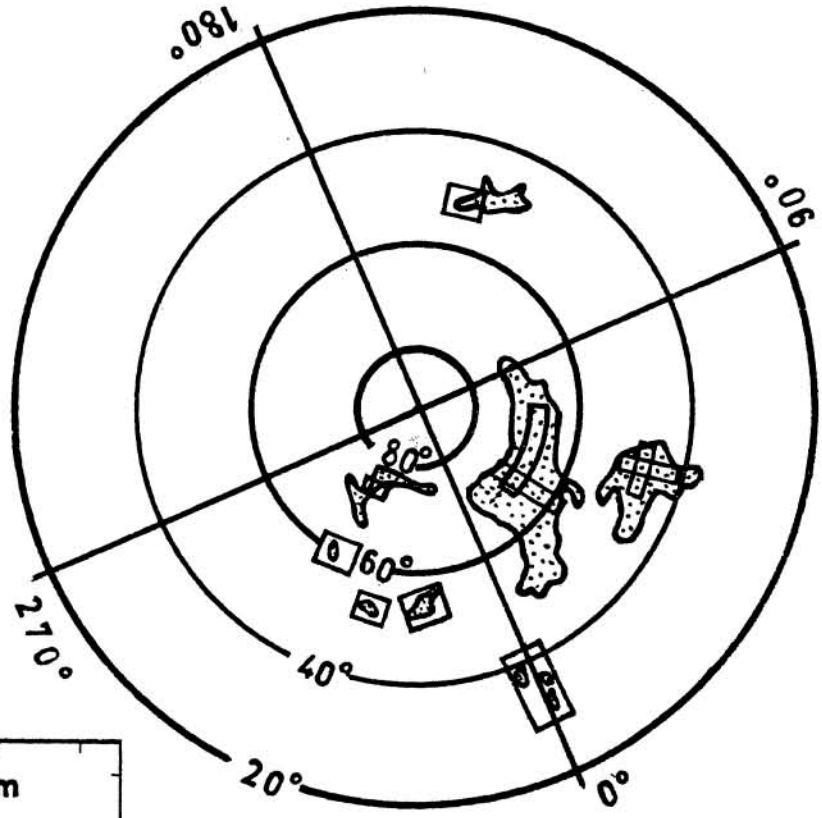

Fig.1. The position of investigated tesserae areas are shown for northen hemisphere of Venus.

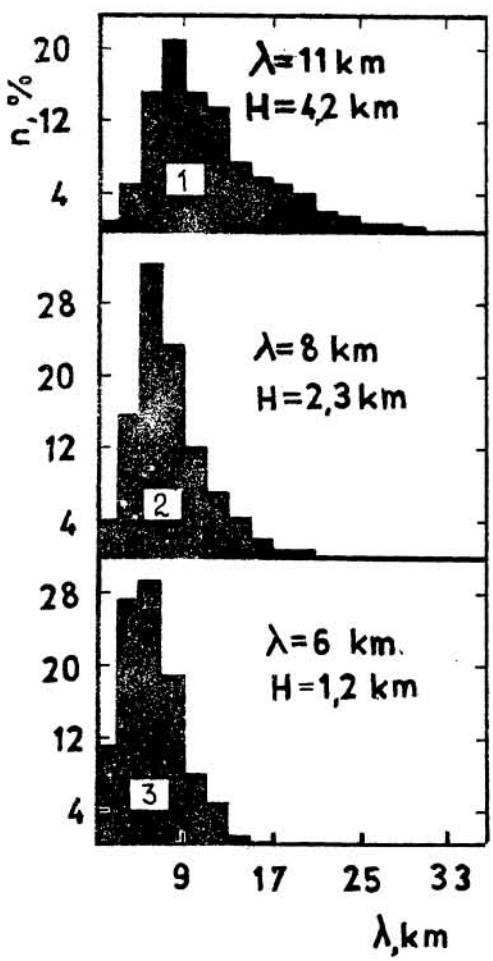

Fig.2. The histograms of spacing values for tesserae. 1 - Fortuna tessera; 2-Laima tessera; 3 - all small tesserae; λ - spacing value; H - relative elevation above plains.

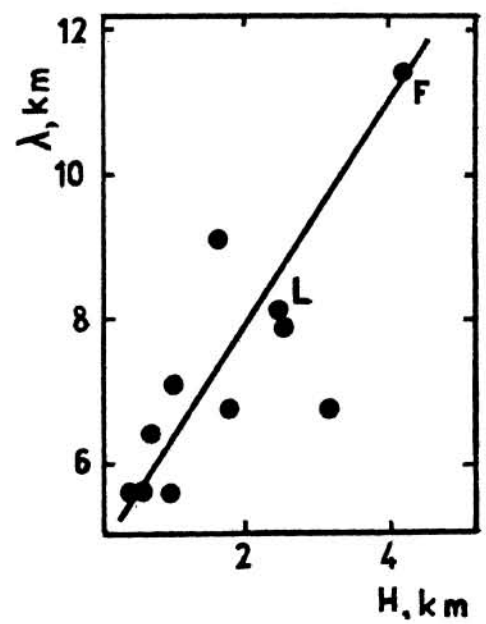

Fig.3. Spacing on tesserae vs.relative elevation above plains. ● F - Fortuna tessera; ● L - Laima tessera; ●- small tesserae.