

ARE TESSERAE THE OUTCROPS OF FELDSPATHIC CRUST ON VENUS?

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The hypsometric curve of Venus is commonly considered to be unimodal /1/ or slightly bimodal /2/. Here we intend to show that the observed hypsometric curve of Venus can be reasonably well approximated as a sum of three individual curves. So, it can be considered in this sense as a trimodal one.

ANALYSIS. Let's assume that the curve representing the altimetry data distribution on Venus can be approximated by one or more Gauss curves. Then using the least-square technique it is possible to perform the computer selection of the curves' combination which fits best the PV altimetry data /3/.

The topography distribution of Venus is known to be slightly shifted to higher elevations /1/: the main peak is not symmetric and does not fit well any sole Gauss curve. The best approximation selected by using two Gauss curves is shown in Fig. 1. This approximation, however, does not fit well the area of high topography. Then the combinations of three Gauss curves were tested. As a result (Fig. 2) the high topography excess is being involved and the total approximating curve reveals a very good fitness of the measured curves.

Now let's consider the PV altimetric data for the zone which overlaps the areas surveyed both by PV and Venera 15/16 (Fig. 3). The combination of three selected Gauss curves demonstrates the same excellent fitness as in the case of Fig. 2.

Fig. 4 presents the exaggeration of curves corresponding to modes I, II and III in comparison to the observed elevation distribution for tesserae within the area surveyed by Venera 15/16. One can see that mode II distribution is largely contributed by the tesserae elevation pattern.

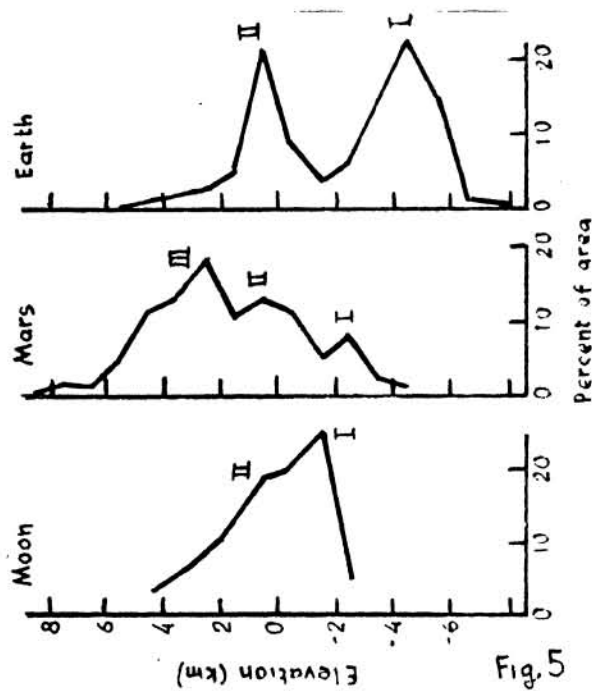
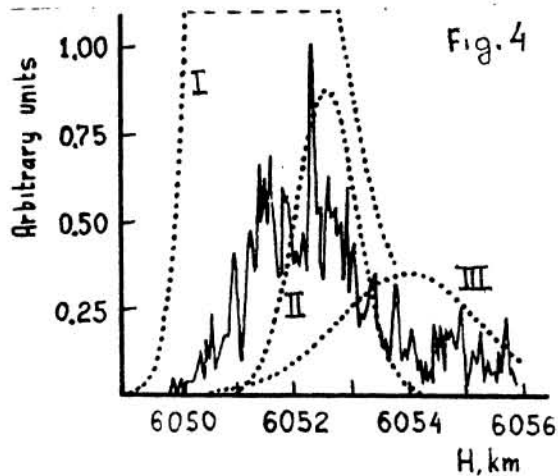
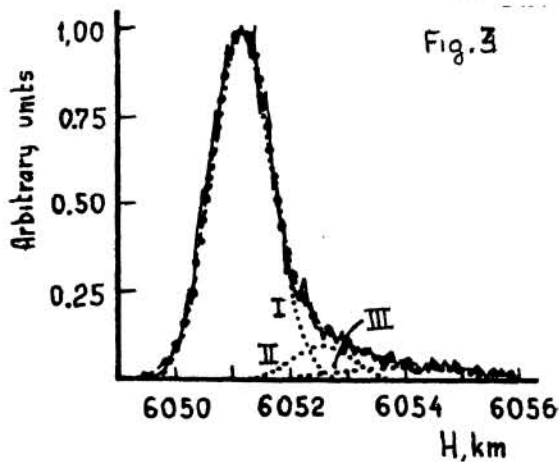
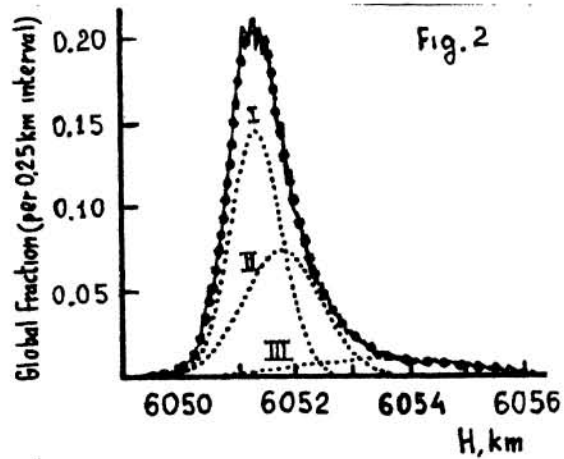
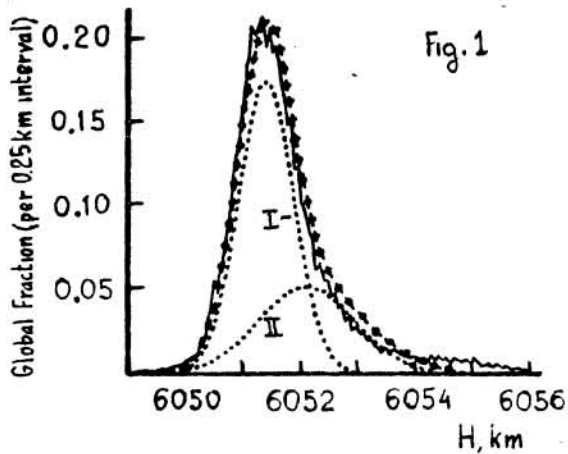
DISCUSSION. It is undoubtful that the deduced mode I corresponds to the plains which combine lowlands and rolling plains by Masursky et al. /1/. As it was shown above mode II corresponds mainly to tesserae. Non-tessera high elevations (large updomings and Lakshmi plateau with its surrounding) appear to be responsible for mode III. Among the terrestrial planets only Mars has trimodal distribution of surface elevations (Fig. 5). These Martian modes correspond to lava plains (I), cratered uplands (II) and young updoming of Tharsis plateau (III), respectively /1/. The highest surfaces on Venus also correspond to the deduced mode III being represented in their significant part by young /4/ updomings. These features are characterised by volcanism, rift-like structures and strong gravity anomalies explained by dynamic support /5/.

Not taking into account these highest features (mode III) modes I and II for Venus and Mars can be considered as principal counterparts of modes I and II /1/ for Earth and the Moon. The low elevations (mode I) on Earth, the Moon, Mars and Venus are well known to correspond to basaltic lava plains /1, 6/ which on larger planets are spread wider comparing to smaller ones /7/. As it was summarised in /8/, the continents (highlands) on Earth, Mars, Moon correspond to the area composed mainly of granitic (essential feldspathic) material (Earth) and anorthositic (also feldspathic: Moon and, may be, Mars). This can be considered as an evidence that Venus mode II can be also related to the presence of low density feldspathic material. As it was shown above, tesserae are mostly responsible for hypsometric mode II on Venus. This leads to suggestion that the tesserae can be outcrops of the continental Venusian crust composed of nonbasaltic, feldspathic material. The presence of feldspathic-rich syenitic crust on Venus was earlier argued by /8/ basing on geochemical criteria (interpretation in /9/ of K-U-Th measurements by Venera-8 /10/).

It is interesting to note that as a rule the tesserae standing over the surrounding plains have prominent border cliffs which heights sometimes are up to 1-2,5 km. If the presence of nonbasaltic low-density crust material on Venus is real its burial by basaltic lavas could result in gravitational instability and diapirism phenomena. Clusters of arachnoids within Bereginja Planitia are suspected to be candidates for this case.

No doubt, the only convincing evidence on the feldspathic nature of Venusian tesserae can be direct geochemical measurements.

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