Tessera is characterized by troughs, which define ~110–370-km-long and ~15–50-km-wide east-west-oriented segments of CRT. These elongated areas have some of the highest topography in the Meni Tessera. One of the segments forms the previously mentioned eastern extension of the CRT ("G" in Fig. 1). Although these elongated parts of the Meni Tessera do not have a similar strike as the ridgelike typography and morphology, and they are not composed of clear individual ridges, they do have a strike similar to the ridgelike components in northeastern Tellus Regio.

Structurally Meni Tessera CRT is more complex than northeastern Tellus Regio. The oldest underlying structures are curvilinear ridges, but they are wider and shorter (2–8 km wide and 10–30 km long) and more widely spaced than in northeastern Tellus. There does appear to be very fine ridgelike structures superposed on these ridges, but they can not always be distinguished from scars and normal faults. The dominant direction of the ridges is to be northeast-southwest, but this orientation may be due to more later deformation and the original directions may not be observable any more. Near the eastern edge of central Meni Tessera the ridges follow the curving tessera border. The central parts of Meni Tessera are characterized by areas of orthogonal terrain of intersecting northeast-southwest and northwest-southeast grabens ("H" in Fig. 1). This terrain has been partly covered by lavas of intra-tessera plains in the areas where it is visible. There are also places where graben cut across the border between the CRT and the plain, especially around western and northern edges of Meni Tessera.

The relationships between graben with different orientations is complex: North-south striking graben and individual scars (probably normal faults) cut other features extensively in the eastern and northern parts of the central Meni Tessera. There are also graben oriented in the northeast-southwest direction, especially near the western and southeastern borders, which cut ridges and northwest-southeast graben. In the central parts of the CRT there are northeast-southwest-oriented graben that cut other features, but these graben are frequently covered by lavas. There are also small areas where graben are not widespread or at least cannot be distinguished from small-scale ridges or closely spaced faults. Deformation seems to have followed the same kind of basic sequence as in northeastern Tellus Regio except that there have been several different episodes of graben formation with both spatially and chronologically more complex relationships. Also, differences in orientation and morphology of ridges in Meni Tessera and northeastern Tellus Regio may reflect different original stress regimes. Although no major strike-slip faults were identified in Meni Tessera, there is evidence of probable shear deformation in nearby plains areas.

Discussion and Conclusions: Similarities in the topographic trends, especially the similar types of linear ridgelike features in northeastern Tellus Regio and corresponding elongated segments in northern Meni Tessera, which together form a roughly south-concave arc of topographically higher CRT, as well as some similarities with structures of the CRT of the easternmost Meni Tessera and western edge of northeastern Tellus Regio, indicate that these areas of CRT were probably earlier interconnected. The troughlike plain area between Meni Tessera and Tellus Regio is probably underlain by CRT, which has been disrupted and covered by lavas. The adjacent northern Leda Planitia is deformed by complex intersecting systems of fractures and ridges. Some of this deformation may reflect a presence of a covered basement of CRT. The arclike pattern of tesserae between Kamarri Dorsa and northeastern Tellus Regio may also reflect an earlier larger area of tessera. Similar conclusions were earlier presented on the basis of analysis of Venera data [14,15] and more recently by a comprehensive analysis of distribution and characteristics of tessera from Magellan images [16]. Based on this work, however, it is very hard to define exactly the original extent of the CRT in this region.

Tessera are proposed to form by hot-spot-related volcanism and tectonism [17,18] or by convection-driven tectonics above mantle downwellings [1,9]. The results of this work do not conclusively rule out either model. Analysis of structures and deformation shows that the earliest distinguishable deformation was compression, which was followed by widespread extension and volcanism (formation of intra-tessera plains). This result is in agreement with other studies [e.g., 1,3,11,13] and similar results have been used to support the mantle downwelling model [1,12], but in our opinion they do not leave out other possibilities.

The arclike arrangement of topographically higher ridgelike features in northeastern Tellus Regio and northern Meni Tessera is roughly similar in planform, but smaller than the Dekla Tessera—northeastern Tellus Regio arch in the north. These arcuate patterns of tessera are typical to the area between longitudes 0° and 150°E [16] and could tell us about the scales of deformation of the crust in these areas. Observed complex deformational sequences in the northeastern Tellus Regio—Meni Tessera region do support the idea that the CRT is probably a result of repeated deformation through different mechanisms [20]. We are currently analyzing in more detail structures in Meni Tessera and northern Tellus Regio and their relationships with topography, intra-tessera volcanism, and the deformation and volcanism on the adjacent plains.


N93-14390

EPISODIC PLATE TECTONICS ON VENUS. Donald Turcotte, Department of Geological Sciences, Cornell University, Ithaca NY 14853, USA.

Studies of impact craters on Venus from the Magellan images have placed important constraints on surface volcanism. Some 840 impact craters have been identified with diameters ranging from 2 to 280 km. Correlations of this impact flux with craters on the Moon, Earth, and Mars indicate a mean surface age of 0.5 ± 0.3 Ga. Another important observation is that 52% of the craters are slightly fractured and only 4.5% are embayed by lava flows. These observations led Schaber et al. [7] to hypothesize that a pervasive resurfacing event occurred about 500 m.y. ago and that relatively little surface volcanism has occurred since. An alternative hypothesis has been
shown is the qualitative behavior of the mean mantle temperature \( T_m \). Assuming that the venusian lithosphere stabilized 500 MYBP, it is easy to determine its thermal structure, assuming no basal heating from mantle plumes and no partial delamination. After 500 m.y., the depth to the 1475-K isotherm is 290 km, the depth to the 1275-K isotherm is 180 km, and the depth to the 1125-K isotherm is 120 km. The corresponding depths for a venusian lithosphere with steady-state conductive heat transport are 34, 26, and 19 km respectively. The transient cooling of the lithosphere results in much greater thicknesses, almost an order of magnitude. Such a thick lithosphere is consistent with the large observed topographic and gravity anomalies.

McKenzie et al. [4] have argued that the perimeters of several large coronae on Venus, specifically Artemis, Latona, and Eisthoina, resemble terrestrial subduction zones in both platform and topography. Artemis chasma has a radius of curvature similar to that of the South Sandwich subduction zone on the Earth. Sandwell and Schubert [6] have shown that the morphologies of several coronae are in good agreement with the lithosphere flexure models that have been successful in explaining the sea floor morphology at ocean trenches on this planet. Their flexural profiles yield elastic lithosphere thicknesses of 37 km for Artemis, 35 km for Latona, 15 km for Eisthoina, 40 km for Heng-O, and 18 km for Freyja. These values are consistent with a thick conductive lithosphere. The presence of incipient subduction zones may be an indication of the onset of another episode of active plate tectonics.


SCATTERING PROPERTIES OF VENUS' SURFACE.  
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Radar backscatter functions \( \delta_0(\phi) \) for incidence angles between \( 0 < \phi < 4^\circ - 10^\circ \) have been derived from Magellan altimetry radar echoes. The procedure includes constrained solution of a system of simultaneous equations for which the echo spectrum and echo time profile are inputs. A practical and workable set of constraints has been applied; optimization and improved results are expected as the analysis matures. The scattering functions yield information on small-scale surface structure (tens of centimeters to tens of meters) but averaged over hundreds of km². RMS surface slopes derived from fits of analytic functions to the \( \delta_0(\phi) \) results have been converted to map form and show patterns similar to those reported using other techniques. While all three forms are found on Venus, fit residuals imply that an exponential scattering function matches data better than either the Hagedorn or Gaussian forms in most areas, although the Hagedorn function may be a better descriptor at some sites. Limited study of image data indicates that average backscatter cross section, and possibly its slope, can be derived at oblique angles (\( 17^\circ < \phi < 45^\circ \)). Offsets of the echo peak in altimetry spectra are surprisingly common and are loosely correlated with Venus topography, but no cause for this phenomenon has yet been identified.