which local volcanic and tectonic features and units may be correlated. Finally, very young tectonic marks may be defined by the degree of weathering or eolian modification of a surface. For example, lavas flows at Maat Mons show a decrease in radar contrast and brightness with increasing age (based on superposition relations) [10]. Also, some impact craters retain radar-dark (less commonly radar-bright) halos perhaps consisting of impact debris; apparently related to the halos are dark and light surface "splotches" that may represent relatively young debris and shock-induced surface roughness produced by impacting bolides of a narrow size range that disintegrated deep down in the dense venusian atmosphere [1]. As these features age, they may become less distinct relative to surrounding terrains.

Initially, superposition relations were difficult to ascertain among various geologic units on Venus because of the general difficulty in interpreting topography on the radar images. (Exceptions, such as thick lava flows or domes, were relatively rare). Still, many stratigraphic relations can be determined in plan view, because overlying materials tend to mull or embay the texture and structure of underlying surfaces. More recently, Magellan has produced repeated radar images of selected areas, which permits stereoradargrammetry [11]. In addition, synthetic-parallax stereos images (produced from merged Magellan images and altimetry) commonly show the association between geologic/tectonic-terrain units and regional topography.

Magellan radar mapping shows that Venus has had a complex geologic history that can be unraveled to a large extent from available data. Even though exposed rocks apparently record only a small portion of the planet's history, stratigraphic markers are sufficient to permit the development of a useful scheme of time-stratigraphic units. Such a scheme should result from NASA's new Venus Geologic Mapping (VGM) Program, which will cover the entire planet.

The Deformed Area Between Northeast Tellus Regio and Meni Tessera: The troughlike area is characterized by several irregular patches of CRT, which seem to be remnants of an earlier continuous CRT connecting Meni Tessera and Northeastern Tellus Regio. The CRT areas near eastern Meni Tessera have very similar structures as adjacent Meni Tessera. Linear, narrow fractures form up to 45-km-wide belts on the plain between the CRT areas. These fractures are oriented northwest-southeast in the northern part of the trough and they follow the dominant strike of fractures to the southeastern corner of northern Leda Planitia. They turn to a northsouth direction in the trough. Fractures directed almost perpendicularly against a scarp-like, linear edge of the eastern extension of the Meni Tessera ("G" in Fig. 1) turn near the edge to the north northeast and form a bend in the fracture pattern. The linear edge appears to be a fault (its strike can be traced also further to the west-southwest) and the bend in the fracture belt can be due to right-lateral shear. Fracture belts also cut into areas of CRT. Fractures are covered in some places by plains material, apparently lava flows. Fractures were probably formed by extensional deformation of the area, but later plains formation has covered them extensively.

Eastern and Central Meni Tessera: Meni Tessera is situated between latitudes 45° and 50°N and longitudes 67° and 83°E. It has narrow, topographically distinct extensions to the southeast and east. Its central part is composed of more equidimensional and topographically lower area of CRT. The northern part of Meni...
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 ("O" in Fig. 1). Although these elongated parts of the Meni Tessera do not have a similar strike as the ridgeline typography and morphology, and they are not composed of clear individual ridges, they do have a strike similar to the ridgeline 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 ridgeline structures superposed on these ridges, but they can not always be distinguished from scarps and normal faults. The dominant direction of the ridges is to be north-south/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 graben ("H" in Fig. 1). This terrain has been partly covered by lavas of intratessera 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 scarps (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 northwestern and southeastern borders, which cut ridges and north-west-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 can not 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 ridgeline 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 arc-like pattern of tesserae between Kaman 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 [1,12,19]. 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 intratessera 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 arc-like arrangement of topographically higher ridgeline 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, intratessera volcanism, and the deformation and volcanism on the adjacent plains.

**References:**

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**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