**HORIZONTAL MOVEMENTS ON VENUS**; J. Raitala and T. Törmänen, Dept. of Astronomy, University of Oulu, 90570 Oulu, Finland

**Coronae chains.** Cross-cutting relations of the corona-like features (1) of the Ba'het Patera/Manzon-Gurme feature chain on the 0° meridian from 45°N to 53°N, indicate that the northern structures are older than southern ones (2). Of the three corona-like features of the Neyterkob chain on Ganiki Planitia the westernmost one is older than the middle and eastern ones (3). The corona-like features were caused by active mantle (4,5) under a northward (Ba'het Patera/Manzon-Gurme chain) and westward (Neyterkob coronae) moving crust.

Lengths of 800 km and 500 km for Ba'het Patera/Manzon-Gurme and Neyterkob corona chains, respectively, are measured. The limited length of the coronae groups indicates that the mantle has been active under those areas only part of the surface age. The corona chain lengths together with the half of the mean surface age of $1 \times 10^9$ years (6) give crustal movement rates of .32 to .20 cm/year. Higher movement rates are possible because volcanic plains are relatively young and age estimations include several uncertainties. While the Cytherean crust and mantle moved relative to each other the Ishtar highland may have been partly supported by the northward crustal movement. The mantle activity below coronae was, however, time-wise restricted.

**Bookshelf-like faulting.** Meshkenet Tessera, divided into three main parts by faults and scarps (Gabie Rupes etc.), rises up to 3 km above the planetary medium (7). Each subarea is cut into smaller parts by faults. The orientation of ridges and troughs varies markedly in different areas. The bookshelf-like configuration of Meshkenet Tessera could have been formed by right-handed strike-slip faulting caused by N-S compression or by a dextral faulting and anticlockwise rotation in N-S compression and E-W directed shear (7). Pure strike-slip faulting without any block rotation is not probable. Sructures vary in different blocks and observed geometries are best explained by the lateral faulting and block rotation. Major tesserae were earlier more closely connected to each other or originally formed a single tessera area (7).

**Tectonic scarps** of easternmost Fortuna Tessera are steep, NE- to E-facing arcuate discontinuities in surface struc-tures. Two coronae, Ops and Tusholi, located to the NW and N of Meshkenet Tessera are both bordered in the east by one of these arcuate scarps. The sublatitudinal arcuate ridges on Louhi Planitia north of Meshkenet Tessera and to the east of Tusholi scarp indicates the N-S compression, possibly also displayed by the conjugate ridge sets of eastern Meshkenet as well as by the observed offset along the Meshkenet faults (7). At the western end of this ridge belt close to the Tusholi scarp there is the La Fayette impact crater. Large scarps may be overthrust-like structures formed by E-W compression. If the crustal movement is still continuing and the movement rates above are valid and if the scarps are thrust ones with E-W movement, the crater La Fayette may be thrusted under the Tusholi scarp in $15\text{-}25 \times 10^6$ years.

**Disrupted ridge belt.** Fortuna Tessera borders widely the planitiae of the north pole basin of Venus. Ridges of this area are somehow connected to the large fan-like ridge belt system running from the Ganiki Planitia over the north pole up to Fortuna Tessera. The system consists of major ridge belts with branching subbelts. One of the main ridge belts, Sel-anya Dorsa, is divided into subbelts of narrow parallel closely spaced ridges. It is located on a relative flat planitia surface between Louhi and Snegurochka Planitiae. At 75°N/75°-80°E the ridges of Sel-anya Dorsa are abruptly cut by Fortuna Tessera terrain. These discordances are seen as sudden changes in the surface pattern and can not be understood without assuming lateral movements or deformation.

**Parallel ridge belts.** Along the northern boundary of Ishtar Terra there are several ridge belts parallel to the boundary on the planitia surface. Ridge belts are often interpreted to be compressional structures (8,9,10). Their occurrence on planitia areas parallel to the highland boundary zone supports the idea of multitemporal compressional tectonics. Major ridge belts can be seen to have been formed through repeated thrust tectonics and faulting and folding of the uppermost crust by compression caused by the Ishtar Terra - northern plains interaction.

**Dekla Tessera scarp** zone extends from Audra Planitia and northern Kamari Dorsa to the NE side of Tellus Regio (11, 12). It is an arcuate or ∫-shaped structure with an overall strike of NW-SE. There are several parallel structures along its course. It is less prominent just north of Dekla Tessera possibly due to the Venera imaging geometry while the eastward and northeastward facing parts are the most distinct. The northernmost tip is curved around Audra Planitia and the scarp cuts through the ridges of Audra Planitia. On the northeastern side of scarp at 57°N/82°E there is a small patera (Malintzin Patera) the ridge system of which is cut by the scarp (11, 12). This patera locates close to the scarp but does not affect any way on structures on the tessera side of the scarp while having clear radial ridges of its own on the eastern side. Just to the south of Dekla Tessera a small ridge belt is also cut by parquet terrain. Dekla Tessera consists of several high-lying parts which seem to cut through or cover adjoining structures the scarp being a overthrust structure.

**Polyphase ridge belts.** There are several separate ridge belts in the northern part of the Ausra Dorsa area. Two arcuate or horseshoe-like ridge belts locate just on the continuation of Sigrun Fossae and Ausra Dorsa (9). They consist of parallel ridges following the arcuate horseshoe-shape of the belts. The easternmost ridge belt of the area is divided into parallel subbelts which continue the direction of the southern Ausra Dorsa. All ridge belts of the area form independent systems whose cross-cutting relations can be partly traced. The most distinct one is the northern Ausra

Dorsa, which has mainly N-S directed ridges. It becomes wider and more diverse to the south. The northward open ridge belt arch seems to be younger than the ridges along the Sigrun Fossae zone and the southward open ridge belt arch. It intersects both of those belts giving a strong argument for the repeated or superposed deformation of the area (9).

**Moving crustal areas?** No definite conclusions are drawn of why the crustal units have moved, what has been the actual driving force or which endogenic processes (more exactly than mere ´active mantle´) have been involved. Both in the case of discontinued ridge belts and in overthrust scarps there are some features similar to crustal areas overriding lowland ones. In both cases low-lying planitia units are cut by structures which form long, sometimes repeating, high-rising walls. The existence of discontinuous structures on Venus is evident. Differences in areal structures and an unequal distribution of volcanic formations indicate that properties of the uppermost crust and mantle vary from place to place.

Cytherean structures enable us to study the crust-mantle interaction tectonics of this hot planet, possibly slightly similar to the early Earth with aspects not assumed in the present paradigm of plate tectonics. The endogenic engine makes the crust move in a way which varies in different areas and with time. To explain observed Cytherean structures a new paradigm of the global tectonics of terrestrial planets is needed. It should include both intensive hot spot effects on the crust and observed horizontal movements of crustal units. The Magellan mission will help us to increase the knowledge of diversity of the tectonics of Venus and of the processes behind present surface structures.

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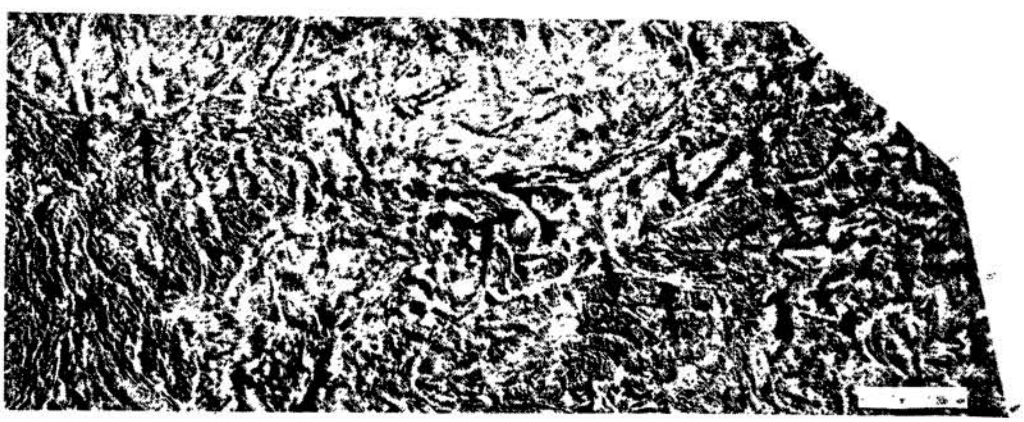

Figure 1. Venera 15/16 radar image of the eastern Fortuna Tessera - Meshkenet Tessera area. Arrows indicate features discussed in the text.

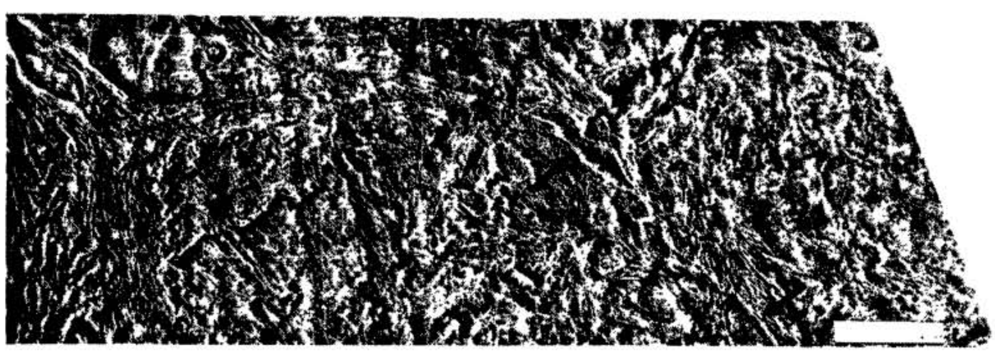

Figure 2. Venera 15/16 radar image of the northern part of the Dekla Tessera scarp zone. Arrows indicate features discussed in the text.