SURFACE EXPRESSION OF GRAVITATIONAL RELAXATION OF TOPOGRAPHY: SOUTH SCARP OF LAKSHMI PLANUM, VENUS; **A. A. Pronin,** Vernadsky Institute, Kosygina 19, Moscow, Russia and **M. A. Kreslavsky,** Astronomical observatory of Kharkov University, Sumskaya 35, 310022 Kharkov Ukraine

Study of recently formed tectonic features in a region of Eastern part of South scarp of Lakshmi Planum on Venus was carried out basing on Magellan radar images and altimetry. In the frame of a simple model for gravitational spreading of ductile crust of different thicknesses a distribution of surface stresses was calculated for the region. Patterns of observed deformations and modeled stress field coincide for crustal thickness of 45 km or somewhat greater.

Introduction. High temperature of venusian surface causes lower part of the crust to be relatively weak (e.g. [1]), that promotes gravity driven relaxation of topography. On the other hand low rate of exogenic resurfacing on Venus promotes surface manifestation of the relaxation to preserve and appear on radar images as small-scale tectonic features. This paper continues our work on modeling of surface expression of gravitational relaxation in Ishtar Terra [2,3] using high resolution Magellan data [4]. Eastern part of South scarp of Lakshmi Planum **(Fig. 1)** was chosen for this study because of its steep complex slope and good coverage with Magellan topography data and images.

Observations. Advanced geomorphological study of the region was focused on establishing signatures of the most recent tectonic deformations. Small-scale most recent tectonic features crossing others were treated. Sets of subparallel fissures situated at the upper parts of the scarp indicate on local extension in direction across the fissures. Sets of subparallel sinuous ridges on dark lava plain at the foot of the scarp reveal local compression (like shown in **Fig. 2, 3).** Areas of extension concentrate predominantly above the main scarp, while compression is usually below it **(Fig. 1)**; It allows to consider tectonic features to be related with gravity-driven processes.

Model. The crust was modeled as a uniform viscose layer of thickness H lying over a rigid substrate modeling strong upper shell of the mantle. Relief of free surface of the layer was taken from Magellan altimetery data for the region under consideration. Equations of linear fluid dynamics was used to calculate distribution of strain rate caused by gravity driven flow (e.g., [1, 5]). An example of results for $H = 45$ km is shown in **Fig. 4**. An attempt to apply less simplified models with two-layer structure of the crust showed that only slightly does resulting pattern of strain signature depend on details of crust structure. Pattern of compression and extension depends first of all on depth of transition from less viscose to more viscose (or rigid) material. That is why we use the simplest model with only one parameter H.

Conclusions. Comparison of pattern of recent deformation signatures observed in studied region with model strain rate distributions reveals good coincidence for H=45 km or somewhat greater. The coincidence evidences the spreading origin of recent tectonic deformations and gives an estimate of crust thickness in the region.

References.

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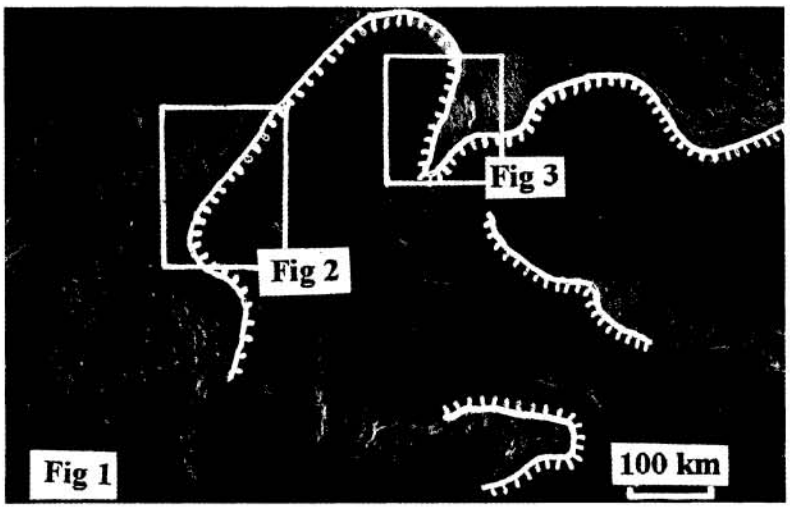

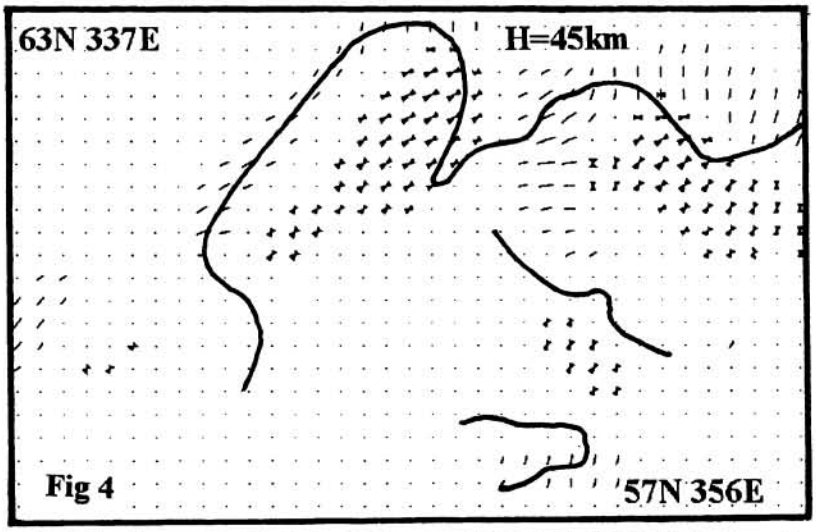

Fig. 1. Radar image of Eastern part of South scarp of Lakshmi Planum (C1 MIDR 60N347 fragment). Location of main scarp and areas shown in Fig. 2 and 3 are outlined.

Fig. 2. High-resolution radar image showing a set of fissures (upper left corner) indicating recent NE-SW extension (F MIDR 60N344 fragment).

Fig. 3. Another example of high-resolution radar image showing a set of extensional fissures and compressional ridges indicating recent NE-SW deformations (F MIDR 60N344 fragment).

Fig. 4. Model stress field for crustal thickness H=45 km. Directions of principal stresses and their relative values are shown. Thin lines designate extension, triangles - compression. Location of the main scarp is outlined by solid line.