NEW DATA ON CORONAE BRING UP NEW QUESTIONS AND TASKS IN RESEARCH OF VENUS. V. P. Kryuchkov, J. Raitaala, and T. Tormanen, Vernadsky Institute of Geochemistry and Analytical Chemistry, RAS, Moscow, Russia, kvp@geokhi.ru Dept. of Physical Sciences, University of Oulu, Finland.

**Introduction:** Recent models of origin of Venussian coronae propose them as the result of rising mantle in which hot viscous material produced lithosphere domes that subsequently relaxed [1-4]. If mantle rise and the following dome relaxation were only influenced by Venussian gravity the planform corona shape on the surface should be a circle. However, majority of the coronae are not circles.

In the first approach, the shapes of the coronae in plan view are more similar to ellipses. Since the structure shape reflects deformation in a surface environment under the influence of the stress field, the elliptical shapes of the coronae reflect natural ellipses of deformation in different areas on the surface. So from orientation of the corona ellipse it is possible to define main directions of the stress field at the time of corona formation. The long axis of these structures is the direction of extension and the short axis corresponds to the direction of compression. Besides, the ratio of the short axis to the long axis gives a degree of the ellipticity. This abstract reports the first results of the analysis of the distribution of the azimuths of the long axes of the coronae and the ratios of the short axis to the long axis of these structures in the northern hemisphere of Venus.

**Data and Measurements:** Magellan C1-MIDR images were used as data source for this work. Framelets of each C1-MIDR image were combined into a mosaic using software developed by V.K. Borozdin. The shape of a corona is approximated as an ellipse drawn along the contour of the outside boundary of the structural rim. Radii of curvature at the ends of the long axis and the short axis are visibly different, and these characteristics simplified the task of approximation the shape of the coronae to an ellipse. Similarly the inner contour of the rim of the coronae was defined (see Fig. 1 and Fig. 2). The coordinates of the end points of the axes were measured in image pixels and then transformed into geographic coordinates of Venus, from which the real lengths of axes on the planet surface were obtained. The azimuth of the long axis for each corona studied was calculated in the point where the long axis of the corona intersects with the center meridian of the corona. This method was used to determine these parameters of elliptical form for 157 coronae. At the present moment coronae have been measured in the area from 7.5° S to the north pole. However, not all coronae were measured in the studied area because some structures are only partly covered by one C1-MIDR quadrangle. In other cases, the actual shape of the structure was uncertain, and also, we are exploring how to better determine elliptical forms in the coronae, so we measured only the more distinctly elliptical features. The Crumpler et al. catalog of Venussian coronae has more than 500 structures for the whole planet, so the studied 157 coronae for half of the surface is rather a representative sample.

**Results and Discussion:** Distribution of the ratio of the short axis to the long axis shows that majority of the coronae are elliptic (76% of the structures have a ratio less than 0.9, Fig. 3a). This means that the coronae were formed in conditions of an asymmetric stress field. It is significant that the distributions of these ratios are obviously different for the outer and inner boundaries of the rim possibly reflecting differences in development inside and outside the coronae. A closer comparison of the near equatorial zone (7.5°S to 30°N) and the middle to high latitude zone (30°N to 90°N) reveals a decrease of the maximum on a value of 0.9 of the short/long axis ratio in the higher latitudes (Fig. 3b,c). This tendency can be interpreted as an indication of inhomogeneous environment or larger stress field variations in higher latitudes comparing to the near equatorial zone.

The azimuth of the long axes of the elliptical coronae is not constant. Three coronae appear to have different formation ages and at the same time they have different azimuths of the long axes (Fig. 2). This evidence may indicate that stress fields or environment inhomogeneity can change in time. The distribution of azimuths of long axes of elliptical coronae shows rather broad variety (Fig. 4). The most interesting observation is that the azimuths of the NW directions are at least two times more common than the NE directions. Based on this result it can be suggested that there were possible changes in the rotation of the planet around its axis. It is significant that the azimuths of the long axes of the elliptic coronae are different close to the equator (7.5°S – 30°N) compared to the middle and higher latitudes of the Venussian northern hemisphere. Distributions of the azimuths of the outer and inner contours of the corona rim differ in a similar way between the zones.

Fig. 1 An example of definition and measurement of coronae elliptical shape.

Fig. 2 A modification of an azimuth of long axis with a different age origin of coronae.

Fig. 3 A distribution of ratio short axis to long axis of coronae in northern hemisphere of Venus.

Fig. 4 A distribution of azimuth of long axis of coronae in northern hemisphere of Venus.