

GEOLOGY OF AKKRUVA COLLES AREA ON VENUS: VENERA 15/16
SAR IMAGES ANALYSIS

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Geologic/geomorphic mapping was fulfilled for the B-14 quadrangle of Venera (BEHEPA in Russian) series 1:5,000,000 photomap. The area is located between 40 and 60°N, 90 and 135°E. Venera 15 and 16 1,8 km/pixel radar images were used for the mapping. Five principal terrain types were outlined: (1) tesserae, (2) hilly terrains, (3) plains, divided into five subtypes, (4) coronae, and (5) groove belts. Within some of these terrains there are volcanic, tectonic, and impact features, which are shown on the map.

TESSERAE are located at the boundaries of the quadrangle: eastern part of Tellus Tessera is at SW corner of the area; northern part of Kutue Tessera is at the S frame; western part of Ananke Tessera is at the E frame, and unnamed tessera is at NE corner. Tessera terrains in the area are highlands reaching up to 2.5 km over 6051-km-sphere. The surfaces of the tesserae are cutted with the systems of grooves and canyons. These systems have different patterning: orthogonal - in Tellus, rhombical - in Kutue, longitudinal and diagonal to tessera outlines - in Ananke, and subparallel to the tessera outlines - in the unnamed one.

HILLY TERRAINS occupy the largest part of the quadrangle. They are elongated from NW to SE along the diagonal axis of the area. This vast belt of hills is known as Akkruva Colles. The hills have very small topographic heights over the plains. Hilly areas are changed in many places with plain areas looking as plain material embayed the hilly terrains. Individual hills are 2 - 10 km in diameter and have non-steep slopes. Typical distances between the hills are 10 to 15 km.

The hills are distributed over the area chaotically. There are clusters of hills at a number of locations. At the areas of hilly terrains adjacent to the plain areas the hills are more scattered, the distances between the hills are larger than in the inner parts of hilly terrains.

The whole area of hilly terrain is cutted with the net of tiny crossing lineations. There is prominently long, shallow, graben-like structure running NW to SE along the axis of the wide belt of hilly terrain - Akkruva Colles.

At the eastern part of the quadrangle the hilly terrain step-by-step joins itself into Ananke Tessera highlands. This transition looks like the hilly terrains are the result of volcanic changes of tessera through covering tessera with plain material and gradual sinking of such tessera areas. This point is supported with the presence of tessera-like areas (tens of kilometers across) located within the hilly terrains.

GEOLOGY OF AKKRUVA COLLES ON VENUS: Nikishin, A.M. et al.

PLAINS in the quadrangle are of five subtypes: (1) smooth, (2) radar-splotched, (3) banded, (4) circumvolcanic, and (5) circular-splotched. All plains are located at topographic level 1 ± 0.5 km over the 6051-km-sphere. Age (stratigraphic) relations between the plains' subtypes were not established around the whole mapped area. Only in places one could see transgressions of one subtype plain material into another subtype area.

CORONAE are located in the NW corner of the map sheet. There are two coronae partly located within the quadrangle: Fakahotu Corona and Vacuna Corona.

Fakahotu Corona is elongated N to S and have dimensions 300 x 450 km. This feature is located in the center of isometrically-shaped plain area with diameter about 500 km. The corona consist of three zones: central plain, southern ridge frame, and northern ridge frame. The ridges have branches and often change their direction abruptly.

Vacuna Corona is located within the area only with its southern part. It resembles the ridge belt which could be part of the ancient corona burried with volcanic plain material.

GROOVE BELTS consist of a number of spacerly located grooves. Friagabi Fossae belt superposes the hilly terrain. The belt consists of sharp grabens 6-8 km wide located 40 km apart.

An unnamed groove belt in the NE corner of the area superposes both hilly terrain and plain. Further north (just outside the sheet frame) this belt is cutted with S boundary of Nightingale Corona. So, the grooves were formed after the hilly and plain terrains, but before the Nightingale Corona.

Volcanic centers consist of five types: (1) small cones, 2-10 km in diameter; (2) large domes, 20-50 km in diameter; (3) smooth volcanic shields, 50-100 km in diameter; (4) small calderas, around 10-30 km in diameter; (5) large calderas (or tectonic-magmatic depressions), 50-150 km in diameter.

Tectonic features on the map include large lineaments (faults), prominent scarps, individual grooves and ridges.

Impact craters are very rear within the sheet - only three small craters, 8 to 16 km in diameter, took place in hilly terrain area. Other terrain types possess no impact craters.

CONCLUSIONS. (1) Tesserae are 1-2 km higher than the plains. They are clearly embayed with plain material. So, the tessera terrains have lighter and/or thicker crust than the plain areas, and tesserae are older than the plains. (2) Hilly terrains have been formed due to volcanic modification of tessera terrains. (3) The plains are the result of areal volcanic activity. Some of them have been formed in course of lava flooding of hilly and tessera terrains. The surface morphology of plains recembles one of terrestrial basaltic plateaus. (4) Coronae were formed over the mantle hot spots. (5) Volcanoes in the centers of circumvolcanic plains were formed over small-scaled mantle hot spots.