GEOLOGIC MAPPING OF V17 BETA REGIO QUADRANGLE: PRELIMINARY RESULTS: A.T.Basilevsky, Vernadsky Institute, Russia Academy of Sciences, Moscow, 117975, Russia, abasilevsky@glas.apc.org and Brown University, Providence, RI 02912 USA.

INTRODUCTION. Geologic mapping of the area under study led to the conclusion that a significant part of the geologic history of this region was practically the same as in the majority of other areas of Venus: 1) deformation of material of unknown nature into tessera terrain; 2) emplacement of mafic lavas and their dense fracturing; 3) emplacement of mafic lavas and their broad ridging; 4) emplacement of mafic lavas and their wrinkle ridging. After that a large-scale geologic event specific for this given area occurred: a mosaic of plains and tessera was domically uplifted thus forming the Beta upland. Its summit was cut by the NS axial Devana Rift zone which had practically no associated volcanism within the V17 quadrangle, but further south the rift-associated Theia Mons volcano was formed.

This study is a part of a NASA supported Venus Regional 1:5M Geologic Mapping Program. The mapping was done using Magellan C1- and partly F-MIDRP and F-MAP mosaics. The area under study 25-50°N, 270-300°E includes the northern part of Beta Regio upland cut by the N-S Devana Chasma rift and the neighboring part of Guinevere Planitia.

STRATIGRAPHIC UNITS. Photogeologic analysis led to the identification of eight material stratigraphic units, seven of which were previously identified by (3,4) in other areas of Venus. The units (from older to younger) are as following:

Tt - Tessera material composes tessera terrain, which has a morphology like tesserae in other areas of Venus, is characterized by two or more intersecting systems of ridges and grooves of evident tectonic origin. Tessera forms islands typically standing a few hundred meters over the surrounding plains and is embayed by them. Four islands, each several hundred km across, form an E-W band, a significant part of which is within Beta Regio. These few large and numerous small islands of tessera within Beta Regio show no agreement with its basic structure. A cluster of tessera islands, each a few tens of km across, is observed at the NE part of V17 within Guinevere Planitia. Interpretation: Heavily deformed material of unknown nature.

Pdf - Densely Fractured Plains material forms linear, radiating and arcuate bands with dense radar-bright lineaments (fractures?) organized into subparallel, radial and/or concentric patterns. These bands, embayed by younger plains, are usually arranged into interconnecting belts and coronae. Sometimes Pdf is closely incorporated into tessera and is mapped as part of it. Interpretation: Mafic lavas heavily deformed by extensional faults.

Pfr/RB - Ridged and Fractured Plains and Ridge Belts materials form generally smooth plains of intermediate radar brightness with small densely fractured inlets. It is locally warped into broad linear ridges (thus forming Ridge Belts). This material is most abundant at the western slope of Beta uplift. It embays tessera and is embayed by younger plains. Sometimes it is so closely incorporated into tessera or so intimately interfingered with Pdf that it is mapped as part of Tt or Pdf. Interpretation: Mafic lava locally deformed by compressional deformation and containing inclusions of Pdf.

Psh - Shield Plains materials is a unit first identified by (1) in Vellamo Planitia. In Beta Regio it forms areas (typically 100-200 km across) of abundant to coalescing small shield-shaped features with varying amounts of smooth plains in-between. It embays Tt, Pdf, and Pfr/RB and is embayed by younger plains. Sometimes Psh is deformed by wrinkle ridges. Interpretation: Fields of shield-like volcanic edifices partly separated by plains-forming floods.

Pwr - Wrinkle-Ridged Plains materials form generally smooth intermediate-dark to intermediate-bright plains complicated by narrow wrinkle ridges. Pwr is the most abundant terrain in the mapped area. Venera 9, which landed at Pwr plains of this area on the eastern slope of Beta uplift, measured contents of K, U, and Th, which are typical for terrestrial tholeites (7). Interpretation: Mafic lavas deformed by compressional deformation.

Pl - Lobate Plains material forms radar-bright and dark flow-like features often coalescing into a radial or fan-like pattern. Not deformed by wrinkle ridges. The largest field of Pl in the

mapped area is associated with the Theia Mons volcano sitting on the Devana rift about 100 km south of the southern boundary of V17 quadrangle. Interpretation: Mafic lava flows.

Cu - Crater Unit materials form crater walls, floor, central peak, ejecta and outflows. 21 craters are identified within the V17 quadrangle (5). This corresponds to an average density of 3.2+/-0.7 crater/10^6 km^2 that is only slightly higher than ~2 crater/10^6 km^2 of the global average (6). Interpretation: Material of impact craters and their ejecta.

DM - Dark Mantle material forms radar-dark areas with diffused boundaries associated with some impact craters. Partly or wholly obscures the underlying terrain. Interpretation: Mantles of loose debris derived from impact crater ejecta partly reworked by eolian processes.

STRUCTURES. Six major types of structures are identified (from older to younger): 1) *Tessera-forming deformation*, graben predominate, structural trends look irregular; 2) *Swarms of lineaments* (extensional fractures?) cutting Pdf, form belts and coronae, their trends at the scale of quadrangle are variable; 3) *Ridges of RB*, formed by compressional deformation, trends vary from NW through N to NE; 4) *Wrinkle ridges*, form regional networks on Pwr complicated by clustering around some coronae, north of Beta have prominent E-W trend, closer to Beta are usually less abundant, less prominent and variable in orientation, no prominent concentric alignment around Beta in this sense the Beta uplift differs from W. Eistla uplift. 5) Extended *swarms of long linear graben* radiating around some coronae; 6) *Swarms of anastomosing graben* associated with Devana rift.

The distribution of the majority of the mapped material units and structures shows no agreement with the Beta Regio uplift which is the most prominent topographic and tectonic feature of this area. Only the Devana Chasma fracture belt is related to the Beta uplift being its axial rift zone, and a large field of the Pl lobate flows originated from the Theia Mons volcano is associated with the Devana rift. This evidently means that the Beta uplift is geologically young, formed after the emplacement of Pwr and their deformation by wrinkle ridges.

A SCENARIO OF GEOLOGIC HISTORY. The geologic history of the mapped area until the Beta uplift occurred seems to be practically the same as in the majority of other areas of Venus. The earliest event seen in the morphologic record is tessera formation due to intensive (mostly extensional) deformation of material of an unknown nature. This was followed by emplacement of the Pdf mafic lavas and their dense extensional fracturing. A large-scale pattern of that fracturing was a combination of circular (coronae) and linear (belts) trends. Next was the emplacement of the Pfr mafic lavas and their local compressional deformation into ridge belts. This was locally (or regionally?) followed by formation of fields of volcanic shields. Next was emplacement of the most abundant (on the surface) mafic lavas of Pwr plains and their compressional deformation with the formation of wrinkle ridges. Then a tectonic uplift of the plains and tessera mosaics in the southern part of the mapped area and further south occurred, forming the Beta Regio upland, probably due to the rise of the large-scale mantle plume. It was accompanied by intense rifting, resulting in the formation of Devana Chasma. South of the mapped area a large volcano of Theia Mons with extensive flows of probably mafic lavas was formed but within the area of our study the rifting was mostly not accompanied by volcanism. Young volcanic activity within V17 occurred also at Guinevere Planitia in the NW part of the quadrangle. It was associated with a large volcanic center at 52°N, 268°E which started its activity in Pwr time before the emplacement of the wrinkle ridge network and continued to be active for some time after. Through all geologic history of this area meteoroid impacts were forming craters whose ejecta were the source of debris. The youngest craters of the area still preserve mantles of the debris around them.

ACKNOWLEDGEMENT. The work was supported by the NASA Venus Data Analysis Program and the International Science Foundation, grant M2F300.

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