GEOLOGIC MAP OF THE LACHESIS TESSERA QUADRANGLE (V-18), VENUS. E. M. McGowan and G. E. McGill, [1,2] University of Massachusetts, Amherst, Massachusetts. emcgowan@geo.umass.edu

Introduction: The Lachesis Tessera quadrangle (V-18) of Venus is bounded by 300° and 0° East Longitude, 25° and 50° North Latitude. It is one of 62 quadrangles covering the entire planet at a scale of 1:5,000,000. The quadrangle derives its name from Lachesis, one of the 3 fates in Greek mythology. Most exposures of Lachesis Tessera occur in the northwestern part of the quadrangle, although a smaller area lies to the west in the Beta Regio (V-17) quadrangle.

The Lachesis Tessera quadrangle includes parts of the plains regions Sedna and Guinevere Planitiae, overwhelmingly the areally dominant terrains in the quadrangle. In addition, the quadrangle includes two deformation belts and embayed fragments of one or two possible additional belts; 3 large central volcanoes; abundant small shield volcanoes and associated flow materials; 13 impact craters; 4 or 5 coronae; and a number of areally more limited terrains. A prominent structural belt extends from the western boundary of the quadrangle at about 36° North Latitude southeastward to near the southern boundary of the quadrangle at about 324° East Longitude. This belt links Breksta Linea to Zemire and Pasu-Ava coronae, and to smaller deformed regions aligned with this trend. It also includes a probable corona centered at about 323° East Longitude, 28° North Latitude. All but the eastern part of this putative corona is within the wide strip of no image coverage.

Stratigraphy: The stratigraphic units in the Lachesis Tessera quadrangle are grouped into six broad categories according to topographic setting or terrain type: plains materials, volcanic materials, coronae materials, materials of deformation belts, basement materials, and impact crater materials. Twenty units have been defined: 4 plains units, 5 volcanic units, 4 coronae units, 2 deformation belt units, 3 basement units, and 2 impact crater units.

Basement Material: The oldest materials in the Lachesis Tessera quadrangle are mapped into 3 units: tessera material (t), tessera-like material (tq), and bright material (mb). Tessera and tessera-like materials are primarily located in two areas along the western boundary of the quadrangle, where the northern exposures are named Lachesis Tessera, and the southern exposures are named Zirka Tessera. Tessera material is very bright on SAR images, and it is deformed by grabens, ridges, and penetrative lineations, with at least two dominant trends at high angles to each other [1,2,3,4,5]. These structural features dominate texture down to the scale of resolution, and they very likely are responsible for the overall radar brightness of tessera materials. Tessera materials are sharply embayed by all other mapped units. Adjacent plains materials truncate almost all structures superposed on tessera, and also commonly flood grabens that cut tessera material. Tessera material is older than all other materials based on truncation relations and density of superposed structures, and thus is inferred to be the oldest material in the quadrangle. There is no evidence in this quadrangle to determine the relative ages of materials within isolated patches of tessera.

Plains Material: The dominant terrains of the Lachesis Tessera quadrangle are plains. About 80% of the area within the quadrangle is underlain by regional plains, which is subdivided into two members (pr1 and pr2). More local plains units include dark plains material (pd) and mottled plains material (pm).

Regional Plains are characterized by indistinct flow patterns at various scales, and by areally variable radar brightness. Regional plains are mapped as two units, based on radar brightness. The brighter unit (pr2) appears to be younger than the darker unit (pr1). This inference is based on the common presence within the lighter unit of circular or nearly circular inliers of material with radar backscatter characteristic of the darker unit. The circular inliers are most likely low shield volcanoes, which are commonly present on the darker unit, that are only partially covered by the brighter unit. This relationship implies that unit pr2 not only is younger than pr1, but that it is very thin. Clear cut examples of wrinkle ridges and fractures superposed on pr1 but truncated by pr2 have not been found to date. This indicates that the difference in age between pr1 and pr2 is very small. Because they are so widespread, the regional plains are a convenient relative age time "marker". The number of impact craters superposed on these plains is too small to measure age differences [6], and thus we cannot estimate how much time elapsed between the emplacement of the darker and brighter regional plains units.

More local plains units are defined by significantly lower radar backscatter or by a texture that is mottled at scores to hundreds of kilometers scale. Dark plains materials (pd) are superposed on regional plains materials, with local inliers of regional plains. Mottled plains materials (pm) consist of intermingled patches of material that is either dark or moderately bright on SAR images, resulting in a mottled pattern at 50-100 km scale. Its age relative to the age of regional plains is uncertain.

Corona Material: Structures and materials of at least three and possibly five coronae are present in the Lachesis Tessera quadrangle. These are widely separated; consequently, it is not possible to determine the ages of the coronae relative to each other. The structures defining the coronae cut materials of both regional plains units. The ages of the generally sparse flows associated with the coronae relative to plains and other materials are ambiguous, although some corona materials appear to be younger than adjacent regional plains.

Volcanic material: Scattered around the quadrangle are exposures of various volcanic materials: isolated flows (f), materials of central volcanoes (mva, mvb), and materials of shield flows (fs, fsd). Isolated flows (f) are mostly moderately bright, relatively rare, digitate flows that generally do not have a resolvable construct at their source.

Structural Geology: Important individual structural features include radar-bright lineaments, grabens, and wrinkle ridges, all of which are abundant and pervasive. These individual features commonly occur in poorly defined belts that do not include associated mappable materials. These belts vary widely in trend with respect to each other, and some also exhibit significant variations in trend within individual belts. In addition, there are broad ridges scattered around the quadrangle that may be isolated inliers within younger regional plains or else local folds involving regional plains -these alternatives commonly are not easy to separate [7].

Impact Materials: The 13 impact craters in the Lachesis Tessera quadrangle range in diameter from 2.4 to 40 km. Four of these are actually doublets. Eight of the craters have associated radar-dark halos or parabolas. Only 2 of the 13 craters are significantly degraded. All 13 craters are superposed on either regional plains or on flows that are, in turn, superposed on regional plains. Craters are mapped as crater materials, undifferentiated (c) including materials of central peaks, walls, rims, floors and ejecta. These materials are bright to very bright. Very bright digitate flow material associated with some craters is mapped as crater flow material (cf).

Summary: The Lachesis Tessera Quadrangle is the transition zone from a major area of uplift, Beta Regio, to a major area of plains, Sedna Planitia. This fact alone makes it important to the overall investigation of the evolution of the surface of Venus. Lachesis Tessera Quadrangle also displays a linear grouping of structural features (corona, ridge belts, and fracture belts) of various ages. This type of grouping may shed some light on the smaller scale evolution of the surface of Venus. Many of the current models focus on the global scale (directional or nondirectional) or large regional scale (Beta Regio and Artemis).

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