GEOLOGIC MAP INTERPRETATIONS OF THE SURFACE OF THE NEMESIS TESSERA (V14) QUADRANGLE, VENUS. A. C. Waldron[1], M. S. Blondes[1], W. P. Katzenstein[2] and E. B. Grosfils[1]. [1] Geology Dept., Pomona College, Claremont, CA 91711. [2] Engineering Dept., Harvey Mudd College, Claremont, CA 91711.

Introduction: The global and regional history of the surface of Venus can be interpreted by analysis of radar data and interpretation of individual mapped units. However, choice of mapping methods can lead to different interpretations of units. Areas containing volcanic plains and flows within the Nemesis Tessera quadrangle provide one example of areas in which different mapping strategies lead to different results.

Plains make up approximately 80% of the surface of Venus and normally consist of large basaltic units and smaller lava flows [1]. Shield fields are identified by small-scale, individual, digitate lava flows of ranging surface textures, originating from numerous vents [2]. The most common issues that arise when interpreting plains and shield field-related units are related to the textural contrast necessary to define a distinct border between units, and the use of features, such as compressional ridges and shield volcanoes, to separate units and interpret the origin of specific volcanic flows. It is also important to consider the difference between primary, tectonic and erosional features in any given map [3].

Methods: Four researchers used Magellan data with a resolution of 75 m/pixel, as well as synthetic stereo topographic images, to define and interpret units in areas of the Nemesis Tessera quadrangle. The georeferenced, sinusoidal Magellan images were analyzed and mapped within ArcView. Each researcher determined units independently, but all units were based on interpretation of textural signatures, differing reactions to tectonic deformation, and notation of other relevant features as was necessary, such as flow patterns or topography in some cases.

Results/Discussion: One difficulty with defining units from radar data arises from the somewhat subjective nature of determining the textural difference, reflected by the brightness of the radar data, necessary to distinguish units. Figures 1 and 2 show the same area mapped by different people. The unit defined as a volcanic flow (*V*) in Figure 1 and the unit defined as volcanic plains with multiple flow fields and shield volcanoes (*Pff*) in Figure 2 have roughly the same border, although slight differences are evidence of the fact that even when units are easily distinguishable, the exact borders can still be difficult to define and are often open to interpretation. The units to the east of these in each map show a more striking difference in the mapping methods used by each person. While Figure 1 shows the plains split into two distinct units, intermediate plains (*Pia*) and light plains (*Pl*), Figure 2 classifies the entire area as intermediate plains (*Pi*). Similar differences in mapping can be seen in the northern section of Figures 1 and 2. Figure 1 shows a deformed area (*D*), intermediate plains (*Pib*), and dark plains (*Pd*) all within the area classified as dark plains (*Pd*) in Figure 2.

Differences in defined units can also arise due to interpretation of structural and topographic features, as well as to decisions about whether a subtle textural difference between two areas warrants a boundary line. Figures 4 and 5 show another area of the Nemesis Tessera quadrangle that was mapped twice. In Figure 4, unit *Fl* (radar light flows) is likely closely related to unit *Pvd*, dark plains on which numerous shield volcanoes have been identified. *Fl* could be interpreted as the same material unit as *Pvd*, as *Pvd* appears to flow through a relatively narrow space, which could account for the change in texture of the flow. However, because there appear to be clear boundaries between *Fl* and *Pvd*, *Fl* was mapped as a separate unit in Figure 4. While the interpretation represented by Figure 4 makes textural differences as evidenced by different radar brightnesses the primary factor in distinguishing the difference between *Fl* and *Pvd*, Figure 5 shows the same area as one unit, plains with multiple flow fields and shield volcanoes (*Pff*), and therefore represents an interpretation based more on the flow pattern of the radar light areas and the possibility that different textures do not necessarily indicate different material units.

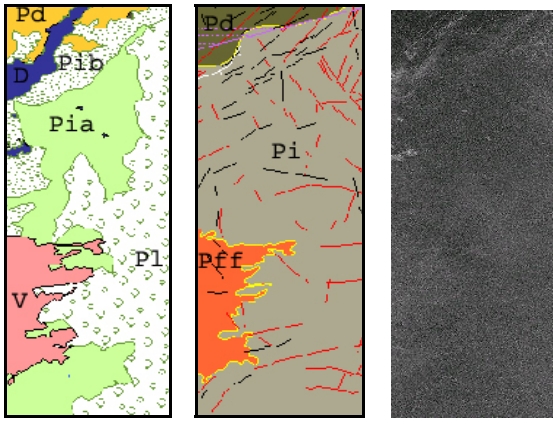
Similar flow units, also defined as *Fl* in Figure 4, are mapped to the east of those related to *Pvd*, and are separate from the surrounding intermediate plains (*Pi*). Figure 5 once again shows these radar bright areas as part of a larger plains unit due to their flow patterns. While Figures 4 and 5 are similar in their identification of a ridge belt (*RB* in both Figures) and light plains unit (*Pi* in both Figures), significant differences exist in the interpretation of the surrounding plains. Therefore, the fact that maps can reflect various mapping methods and interpretations should be taken into account whenever studying any area of the surface of Venus.

Figure 7 represents another area of the Nemesis Tessera quadrangle in which both texture and structure must be considered when distinguishing plains units. The intermediate plains unit *Pib* is an example of a difficult unit to map. The mapper has chosen to distinguish it from surrounding plains units by its

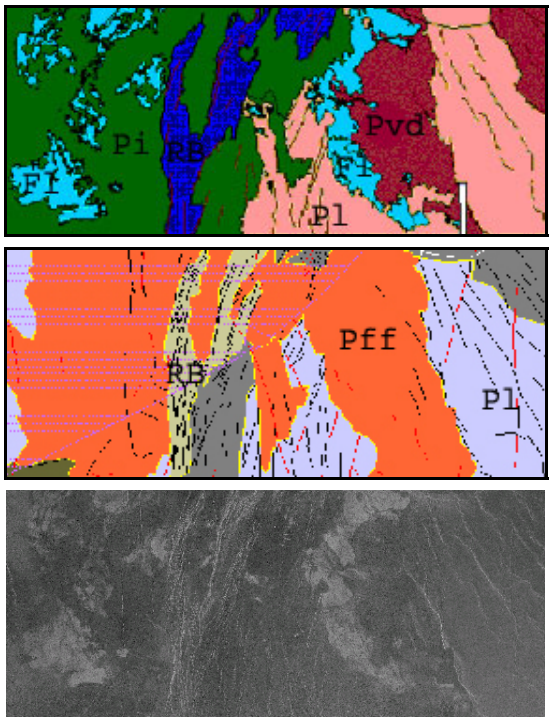
perpendicular lineaments. Also, *Pib* has a slightly darker radar signature than another intermediate plains unit adjoining it, *Pia*, and its contacts with tessera (*T*), light plains (*Pl*), and dark plains (*Pd*) are in part distinguished by textural differences shown by the radar backscatter as well as the identification of perpendicular lineaments on *Pib*. Thus, the contact was defined through structural and textural differences between the units. However, different methods of interpretation could easily lead to different conclusions depending on how a particular mapper decides what grade of textural difference, or amount of distinct structural features, is necessary in order to separate a unit from the surrounding area.

Conclusion: Because mapping is the basis for further interpretation of stratigraphy and processes of geologic formation, it is important to understand the different ways of defining units and the implications of using a specific method. Even with the guidelines in the *Venus Geologic Mappers' Handbook* [4], units are still widely open to interpretation, as can be seen here. Comparing maps of the same area prepared by different people, and examining maps of difficult areas to classify, shows that a varying range of interpretations may be equally plausible. Different interpretations of units lend themselves to determining the implications of different stratigraphic sequences, and whether or not a global system of rock and time correlation is possible.

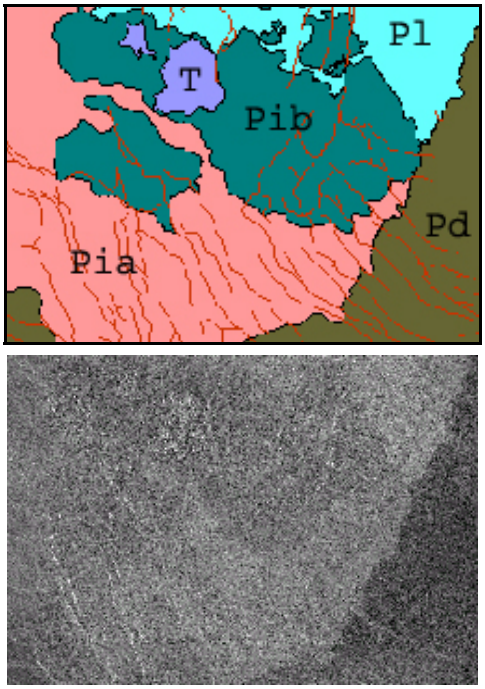
References: [1] Hansen V. L., Willis J. J., and Banerdt W. B. (1997) *Venus II: Geology, Geophysics, Atmosphere, and Solar Wind Environment*, 797-844. [2] Crumpler, L. S. et al., (1997) *Venus II: Geology, Geophysics, Atmosphere, and Solar Wind Environment*, 697-756. [3] Hansen V. L. (2000) *Earth and Planetary Science Letters 176*, 527-542. [4] http://wwwflag.wr.usgs.gov /USGSFlag/Space/GEOMAP/PGM_home.html.



Figures 1-3. When mapped by two different people (Figs 1 & 2) the same area (Fig 3) can be interpreted very differently. Here the principal differences stem from subtle variations in radar backscatter are interpreted. North is up and all three figures are 460 km by 180 km.



Figures 4-6. In this second example, uncertainty about the geologic causes of observed differences in radar backscatter led to very different interpretations of the region's map units. (Note: Figures 2 & 5 were produced by a single person whereas Figures 1 & 4 were made by different people.) North is up, and the region is 170 km by 390 km.



Figures 7-8. In this third example, both subtle variations in radar backscatter and interpretation of structural patterns were used to define map units. This region is one which will be mapped by all abstract authors for discussion at the poster session. North is up, figures are 125 km by 180 km.