GEOLOGY AND SURFACE CHARACTERISTICS OF BELL REGIO, VENUS; Bruce A. Campbell, *Center for Earth and Planetary Studies, National Air and Space Museum, Washington, D.C., 20560*, Patricia G. Rogers, *Planetary Geology and Geophysics Program, Solar System Exploration Division, NASA, Washington, DC 20546.*

Introduction. Bell Regio is a broad topographic rise located at approximately 30°N, 45°E which extends ~1500 km in the N-S direction and is characterized by extensive volcanism. In this work, the geology and surface characteristics of Bell Regio are examined in order to understand the geologic evolution of the region and the surface characteristics of the major volcanic units. Relationships between Magellan SAR backscatter values and altimeter-derived rms slope data are analyzed, and terrestrial SAR data are used to suggest possible surface morphologies.

Geologic Setting. Southern Bell Regio contains at least three large volcanic centers: Tepev Mons, which rises approximately 5 km above the plains to the east, and two unnamed source regions. The first of these sources lies immediately SE of Tepev Mons, and has a 15-km diameter central caldera. The second source area is a much larger region of radial lava flows and chains of pit craters centered between Tepev Mons and the crater Potanina. Large northeast-trending fragmented tessera blocks lie to the west and south of these three volcanic centers, and there are several small coronae to the northwest. Northern Bell Regio is dominated by the corona Nefertiti [1,2,3].

Lava flows associated with the three large volcanic centers in southern Bell Regio embay the surrounding dark ridged plains and tessera blocks. The tesserae in turn are embayed and fragmented by the ridged plains, and are thus assumed to be the oldest units in the region. The ridged plains are next in the stratigraphic sequence, and are composed of two major units distinguished by E-W and SE-NW wrinkle-ridge patterns. The boundary between these two plains units is largely obscured by younger volcanic flows.

Four major volcanic flow units are observed in Bell Regio. The oldest is an extensive, relatively radar-dark group of flows radiating from the volcanic center between Tepev Mons and Potanina crater. The next youngest unit is comprised by the radar-bright flows to the south and southwest, which truncate the earlier dark flows and may have erupted from fractures concentric to the eastern volcanic center. The Tepev Mons summit lava apron appears to have formed next, creating an oval collection of interfingered mottled and dark flows. Finally, activity centered on the small caldera to the SE of Tepev Mons erupted a series of radar-bright flows which encircle the Tepev summit apron and embay portions of the northern tessera fragments.

The large volcanic center to the east of Tepev Mons may be responsible for the bulk of the vast flow fields in southern Bell Regio. There are major differences in the style of volcanism between these two centers; Tepev Mons has a pair of well-defined calderas with a relatively limited apron of narrow flows, while the eastern center has a poorly defined central region, long chains of radial pit craters, and much more extensive lava flows. This variation in edifice structure and flow volume may be related to the difference in vertical relief between these two regions. The great height of Tepev Mons may have led to trapping of magma within the edifice and subsequent formation of the summit calderas with relatively minimal surface effusion. In contrast, the lower-elevation eastern region may have provided an easier environment for horizontal magma motion, dike formation, and areally distributed volcanism [3].

Analysis of Radar Data. SAR backscatter cross-sections and altimeter-derived rms slopes were tabulated for a number of representative geologic units from footprint location information in the ARCDR records and C1-MIDR image data. Only footprints which fell completely within the boundaries of a unit were selected in order to minimize mixing of terrain types. Figure 1 presents the results of this analysis for seven surface units. The flows examined have rms slopes ranging from 1° to 9°. Absolute HH cross-section values (no scatter-law correction made) range from approximately 0.025 (-16 dB) to 0.17 (-8 dB).

In general, there appears to be only a weak positive correlation between the rms slope and the backscatter cross-sections for these flows. This suggests that the scales of roughness responsible for quasi-specular scattering close to the nadir are not necessarily produced by the same mechanisms which cause the smaller-scale roughness. This is a reasonable result, since in terrestrial flows the large-scale folds and pressure ridges are relatively independent of the rubble or fragmental glass which forms the small-scale texture.

Comparing these results to data for Hawaiian flows presented in [4], we find that the two brightest flow units shown in Figure 1 are consistent with surfaces of "transitional" to "a'a" texture on Earth. Application of these terrestrial criteria to the entire SAR image shows that only a small group of flows (the north arcuate bright flow and the distal portions of the bright southern flow in particular) are sufficiently radar-bright to match Hawaiian a'a terrains. The vast flow fields south and east of Tepev Mons are characterized by radar brightnesses in the range of terrestrial pahoehoe flows. If terrestrial experience holds [5], this implies relatively low magma effusion rates for these deposits, and their probable emplacement in the form of slowly developed tube-fed flow fields.

The radar-bright lava flows in southern Bell Regio tend to have well-defined margins and often appear to be superimposed on other flow units. There may be several reasons for this result: 1) an observational bias due to the tendency of bright flows to stand out from the background, 2) rougher (a'a-type) flows tend to be thicker than pahoehoe flows, and are thus less likely to be cut by later thin units, or 3) the rough lava flows were late events in the volcanic development of each eruptive center.

References. [1] Janle, P., et. al., (1987) *Earth, Moon, and Planets*, 39, 251-273; [2] Solomon, S., et. al. (1992) *JGR* , 97, 13199-13255; [3] Head, J., et. al. (1992) *JGR* , 97, 13153-13197; [4] Campbell, B. A. and D. B. Campbell (1992) *JGR*, 97, 16293-16314; [5] Rowland, S., and G. Walker, (1990), *Bull. Volc.*, 52, 615-628.

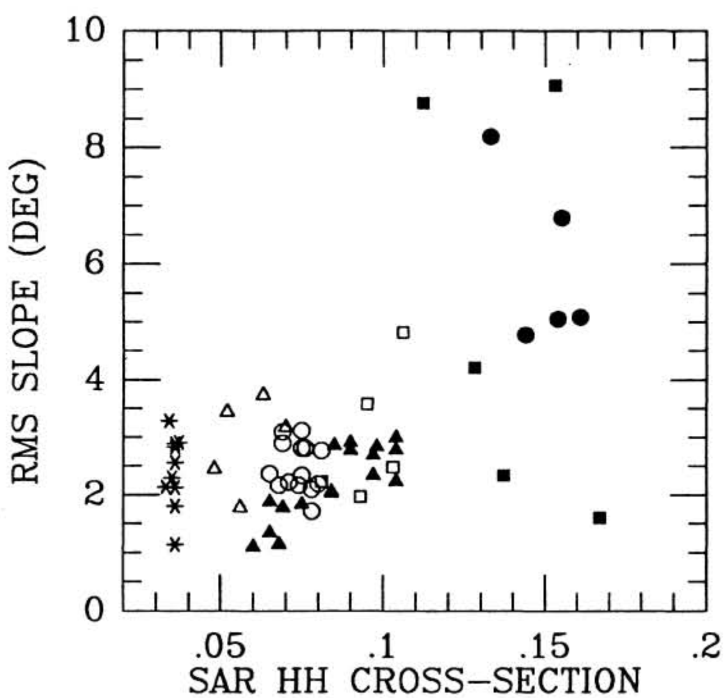

Figure 1. Plot of altimeter-derived rms slope values vs. mean HH backscatter cross-section for seven lava flows in southern Bell Regio. Each flow is represented by a different symbol, and each data point represents the rms slope value for one altimeter footprint along the chosen flow, and the average of all C1-MIDR values within that footprint. Terrestrial SAR data suggest that pahoehoe flows at these incidence angles are typically no brighter than about 0.12; only the two brightest lava flows fall above this value. The two radar parameters exhibit only a weak positive correlation.