temperature is quite significant compared with the effects of gaseous SO_2 and liquid H_2SO_4. Thus, we can state that the variations observed by de Pater et al. [1] are most likely due to the variations in the abundance of gaseous H_2SO_4 and not to liquid H_2SO_4 or gaseous sulfuric dioxide as previously suggested.

A plot of the calculated millimeter-wave spectrum of Venus based on the presence of one or more constituents is shown in Fig. 5. The results reported in this figure show the effect that H_2SO_4 (g) has on the MMW spectrum of Venus. In addition, the results show that there are specific millimeter-wave frequencies that are especially sensitive to the abundance of H_2SO_4 vapor in the lower atmosphere of Venus.

References: [1] de Pater I. et al. (1991) *Icarus, 90,* 282–298. [2] Fahd A. K. and Steffes P. G. (1992) *Icarus,* in press. [3] Fahd A. K. and Steffes P. G. (1991) *JGR, 96,* 17471–17476. [4] Steffes P. G. (1985) *Icarus, 64,* 576–585.

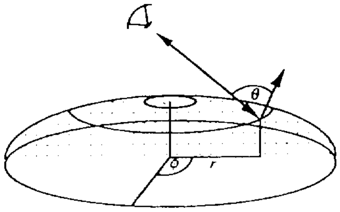
N93-14316

RADAR SCATTERING PROPERTIES OF PANCAKELIKE DOMES ON VENUS.

P. G. Ford and G. H. Pettengill, Center for Space Research, Massachusetts Institute of Technology, Cambridge MA 02139, USA.

Magellan radar images have disclosed the presence of a large number of almost perfectly circular domes, presumably of volcanic origin, in many regions of Venus [1], several with diameters of 30 km or more. Their high degree of symmetry has permitted measurements of their shape, as determined by the Magellan altimeter [2], to be compared with models of dome production from the eruption of high-viscosity magmas [3].

In this work, we examine in detail the radar images of domes in Rusalka Planitia (2.8°S, 150.9°E) and Tinatin Planitia (12.2°N, 7.5°E), selected for their circular symmetry and apparent absence of modification due to large-scale slumping or tectonic rifting. Assuming that these domes are shaped according to the model of reference [3], we can orthorectify the available Magellan SAR image swaths (F-BIDRs: Full-Resolution Basic Image Data Records) to generate three-dimensional plots of the radar scattering cross-section σ_0 (r, θ, ϕ) as a function of distance from center of dome (r), scattering angle (θ), and azimuthal coordinate (ϕ).



The behavior of σ_0 with respect to changes in θ has been determined from Pioneer Venus radar data for many broad classes of Venus surface type [4], and parameterized as a combination of a quasispecular scattering component σ_{qs} and a diffuse component σ_d:

$$\sigma_0(\theta) = \sigma_{qs}(\theta) + \sigma_d(\theta) =$$

$$\frac{\alpha C\rho}{2}(\cos^4\theta + C\sin^2\theta)^{-3/2} + (1-\alpha)\rho K\theta^{\nu}$$

where α represents the fraction of the surface that contributes to quasispecular scattering, C is the Hagfors parameter [5], ρ is the Fresnel reflection coefficient, and K and ν are functions of small-scale surface roughness. Average values of C, ρ, and α over an entire dome are extracted from altimeter measurements.

Variations of σ_0 with respect to radial distance r are interpreted as changes in the small-scale roughness of the dome, which would be expected from the radial dependence of the cooling rate of the lava, perhaps enhanced by subsequent weathering. The result of aeolian processes may also be seen in the dependence of σ_0 on azimuth angle ϕ, since fine-grained surface material that contributes to σ_d may be emplaced or rearranged by the prevailing surface winds.

References: [1] Head J. W. et al. (1991) *Science, 252,* 276–288. [2] Ford P. G. and Pettengill G. H. (1992) *JGR,* in press. [3] McKenzie D. et al. (1992) *JGR,* in press. [4] Ford P. G. and Senske D. A. (1990) *GRL, 17,* 1361. [5] Hagfors T. (1970) *Radio Sci., 5,* 189.

N93-14317

SEQUENTIAL DEFORMATION OF PLAINS ALONG TESSERA BOUNDARIES ON VENUS: EVIDENCE FROM ALPHA REGIO.

M. S. Gilmore and J. W. Head, Department of Geological Sciences, Brown University, Providence RI 02912, USA.

Tesserae are regions of elevated terrain characterized by two or more sets of ridges and grooves that intersect orthogonally [1]. Tesserae comprise 15–20% of the surface of Venus, but the nature of their formation and evolution is not well understood; processes proposed to account for their characteristics are many and varied [2]. Two types of tessera boundaries have been described: Type I are generally embayed by plains; type II boundaries are characterized by being linear at the 100-km scale and often associated with steep scarps or tectonic features [2,3]. Margins such as the western edge of Alpha have been described by these authors as type II. Some of the tessera have boundaries that display deformation of both the edge of the tessera and the adjoining plains [2,3]. This study focuses on the western edge of Alpha Regio in an effort to characterize one occurrence of this type of boundary and assess the implications for the style in general. Using Magellan SAR imagery, lineament lengths, orientations, and spacings were measured for ten 50 × 60-km areas spanning 500 km of the western boundary. Structural characteristics and orientations were compared to stratigraphic units in order to assess the sequence and style of deformation.

Alpha Regio is a 1300 × 1500-km prominent radar-bright upland feature in the southern hemisphere of Venus that averages 1 km above the surrounding plains [4]. Ridges and troughs within Alpha average 33 km long 20 km apart in the north and 35 km long 17 km apart in the south; their prominent orientation is N20°E [4]. The ridges and troughs on the western edge of Alpha have an orientation of N15°E, but differ from the interior ridges as their average spacing is 4 km (Fig. 1). These lineaments are joined by a second set of lineaments and graben trending N55°W and extending into the plains. The deformation producing these northwest-trending lineaments has occurred over a period of time separated by several stages of plains emplacement. Two plains units have embayed the western edge of Alpha: a radar-dark plains unit (Pl_1) that embays the edge of the heavily deformed tesserae, and a radar-bright unit to the west that embays the radar-dark unit (Fig. 2). The plains unit closest to the tessera (Pl_1) has fewer lineaments than the tessera, but a greater number of lineaments (spaced at an average of 3 km apart) than the younger plains unit (Pl_2), which embays and covers unit Pl_1. The