RADAR BACKSCATTERING BEHAVIOR IN THE EQUATORIAL REGION OF VENUS - GOLDSTONE OBSERVATIONS; J.J. Plaut, McDonnell Center for the Space Sciences, Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130, R.F. Jurgens, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

A critical aspect of geological interpretation of radar data from Venus is understanding the radar backscattering behavior of the surface. In addition to the large-scale geomorphologic information typically extracted from radar imaging, constraints on physical properties of surface materials can be obtained from calibrated values of radar backscattering cross-section. Since 1972, the Goldstone Solar System Radar has been used to obtain 45 radar images of Venus during inferior conjunctions. Early observations empolyed a single baseline, two-station interferometer system (1,2), while more recent images were acquired with a three-station interferometry technique (3,4). A geological analysis of the ensemble of data has recently been completed (5). The Goldstone Venus observations are unique among radar datasets for Venus in that they consist of medium-to-high resolution image data (with accompanying altimetry) obtained at small incidence angles, typically less than 10 degrees. In this viewing geometry, the cross-circular polarization backscattered power which the Goldstone system measures is sensitive primarily to the quasi-specular component of the scattering process. The physical controls on backscattered power in this regime are basically limited to (a) regional slopes which affect local incidence angles, (b) slopes with radii of curvature greater than the wavelength (12 cm), and (c) the dielectric permittivity of the surface materials. By contrast, other imaging systems (Arecibo, Magellan) employ much larger incidence angles and have an additional (and in some cases, complicating) sensitvity to wavelength-scale roughness elements. In this study, we have analyzed several sets of Goldstone Venus image data to extract calibrated values of radar backscattering cross-section for a number of geological units found in the equatorial region. Performing this exercise on overlapping images, we have filled in several points on the backscatter versus incidence angle curve for some of the units of interest, to obtain a more complete analysis of the physical basis of the backscattering behavior. This work extends calibrations beyond those reported in (6). In order to obtain accurate values of radar cross-section (i.e. solve the radar equation), several system and observing parameters must be known. These are:

1. Transmitted power.
2. Antenna gain and receiver collecting area.
3. Distance to the planet.
4. Received power, taking into account noise. This is done by estimating:
   a. Reciever system noise temperature and effective bandwidth.
   b. Signal-to-noise, which is measured during acquisition of each range-power profile.

Once these quantities are known, it is a straightfoward procedure to obtain the normalized cross-section (sigma zero) for the entire spherical cap of the planet being imaged, from nadir out to some angular distance. To extract the value of sigma zero for a particular resolution cell in the area of interest, the power recieved at that delay-Doppler coordinate is calculated in terms of the average cross-section, and then normalized to its corresponding surface area. Preliminary results of this analysis indicate that, as first noted in (6), high values of backscattered power in certain regions of the equatorial plains cannot be explained by roughness or slope effects alone. The persistence of large sigma zero values across a range of incidence angles indicates that materials of intrinsically high dielectric permittivity are not uncommon in the low latitude, low elevation plains of Venus.

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