VENUS PIONEER: RATIOS AND COMPOSITE MAPS OF ALTIMETRY, RMS SLOPES AND THE FRESNEL REFLECTION COEFFICIENT - Gerald G. Schaber, Richard C. Kozak, Philip Davis, and Eric Eliason, U.S. Geological Survey, Flagstaff, AZ 86001.

Pioneer-Venus (P-V) radar data sets that include altimetry, C factor (the rms slope is approximated by $C^{-1/2}$ radians, [1]) and ρ factor (the Fresnel reflection coefficient) have been corrected and prepared in final map formats through the efforts of the P-V Radar Mapping Team. These new data sets have been combined into a color composite for a study of Venus surface roughness and geology, and have been ratioed in grey-tone and color maps according to the following formats: C/altimetry, ρ/altimetry and ρ/C (Figs. 1,2,3). Numerous irregularly shaped areas on the venusian surface that have been recognized as anomalous on one or more of the P-V radar data sets were digitized and processed with an interactive image display system. Various statistical data were collected from within these areas, including maximum, minimum, mean, and standard deviations of given data sets. Cluster analysis plots of C/altimetry, ρ/altimetry and ρ/C were obtained for these areas and regression line fits and correlation coefficients calculated.

A number of regions on the venusian surface have been found to possess strong direct or inverse correlation when two or three of the P-V radar data sets are compared. For example, three elevated regions in Aphrodite Terra-Ovda Regio (centered at -5°, 92°), Thetis Regio (-10°, 130°), and Atla Region (+15°, 190° [1] as well as Maxwell Montes in Ishtar Terra [2] and Theia Mons (+24°, 280°) in Beta Regio [2] all have high to very high (7° to >10°) rms slopes and a high average value of ρ (0.267). The foothills (1 to 5 km above mean planetary radius) bordering the high massifs of Ishtar and Aphrodite Terrae [2] have moderately high rms slopes (5 to 7°) and a low average ρ value (0.063). Similarly, Tellus Regio (+35°, 80°) and Alpha Regio (-25°, 05°) have moderately high rms slopes (5 to 7°) and a low average value (0.067) of ρ, but are less elevated ($\sim$ 1.2 km above mean radius).

Atalanta Planitia (centered at lat 63° N., long 160°), Leda Planitia (lat 46° N., long 64°) and Guinevere Planitia (north and east of Beta Regio) are all characterized by an inverse correlation between high rms slopes or ρ and low elevation (Figs. 1,2). The majority of the rolling plains on Venus are characterized by widely diverse rms slopes and reflectivity (ρ).

The ratio map of C/altimetry (Fig. 1) reveals a heretofore unrecognized crater-like form (400 km in diameter) located at lat 38° N., long 295°.

Local and regional differences in rms slopes and radar reflectivity on Venus are providing important new information regarding the scale and type of surface roughness from which we can infer possible geologic processes that now operate and have operated in the past.

References

[1] Pettengill, G. H., Eliason, E., Ford, P. G., Loriot, G. B., Masursky, H., and McGill, G. E. (1980) J. Geophys. Res. 85, 8261-8270.
[2] U.S. Geological Survey (1981) Misc. Inv. Ser. Map I-1324.

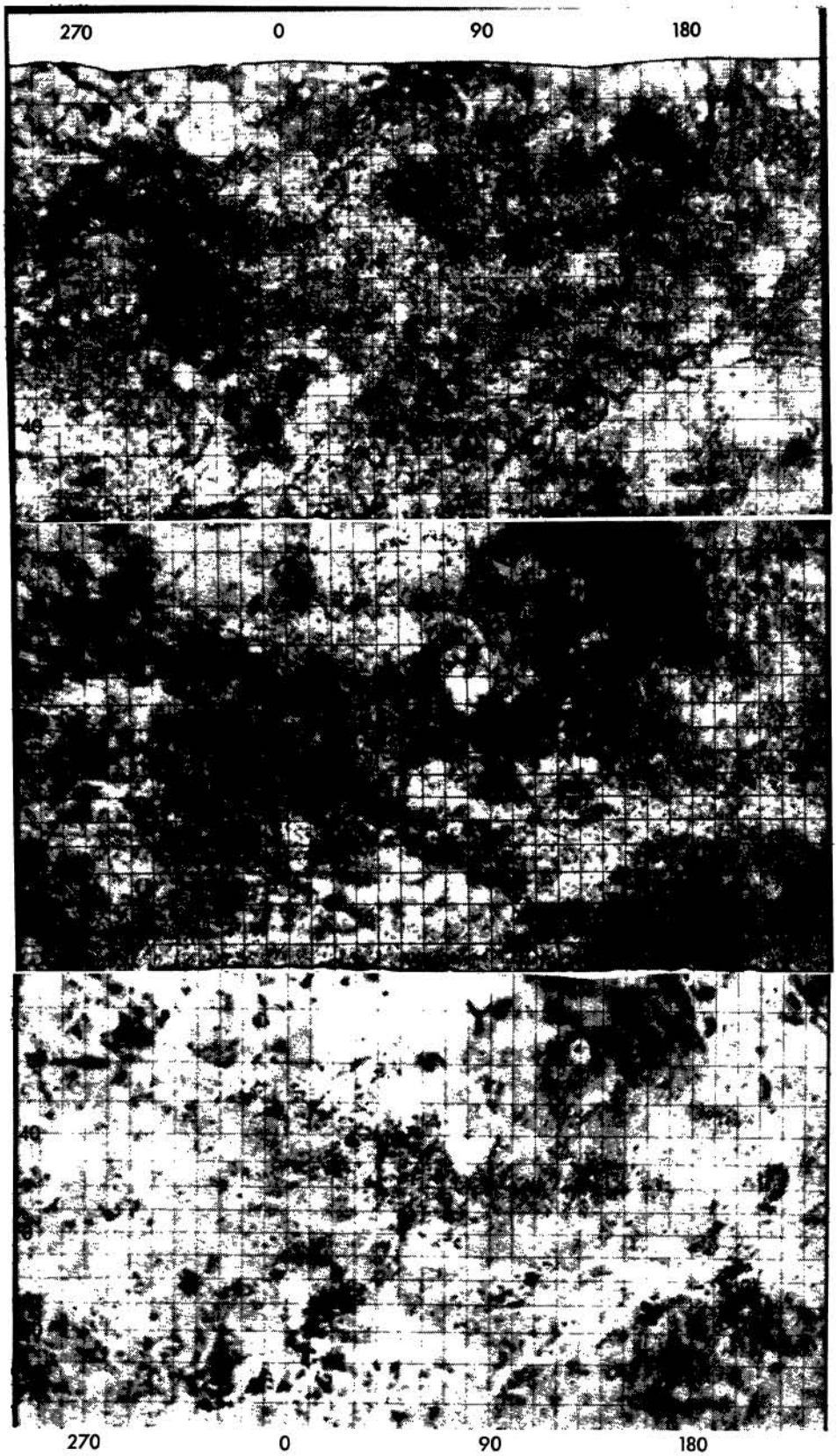

Fig. 1 - Ratio image of C/altimetry derived from the Pioneer-Venus radar data set. High ratios are dark; low are bright.

Fig. 2 - Ratio image of ρ/altimetry. High ratios are dark; low are bright.

Fig. 3 - Ratio image of ρ/C. High ratios are dark; low are bright.