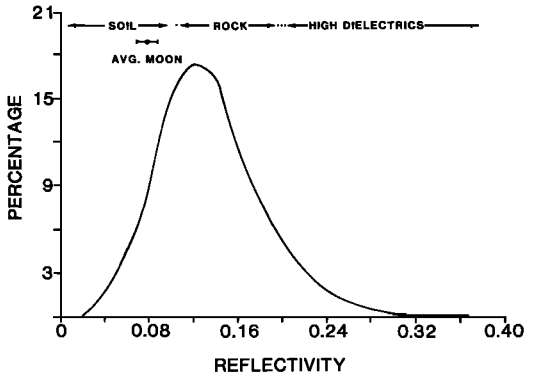

Fig. 2a

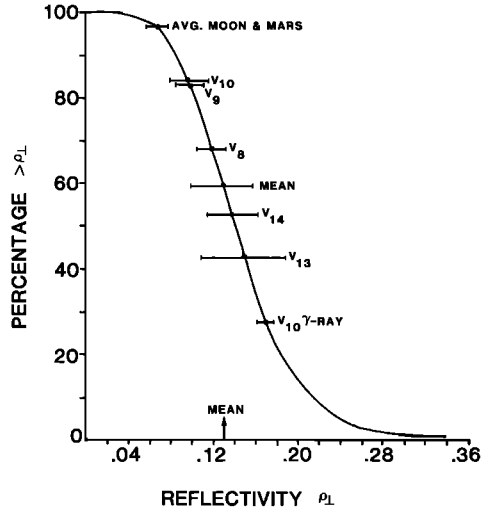

Fig. 2b

Fig. 2. General statistics for reflectivity; Fresnel reflection coefficient $\rho_\perp$ equals radar reflectivity. (*a*) Frequency distribution of reflectivity (horizontal axis) as a function of percent surface area (vertical axis). (*b*) Cumulative frequency distribution with reflectivity on the horizontal axis and cumulative percent area on the vertical. Horizontal bars represent statistics for Venera lander regions (200 × 200 km), "dot" represents mean, and the length of the bar represents the standard deviation. Average lunar values are plotted as well. The Venera 10 gamma ray measurement is for surface density.

is likely to represent high titanium or iron basalts. The process of pyrite formation at volcanic centers on Venus is less clearly understood than simple extrusion of basalt flows, yet pyrite-enriched material could certainly explain some of the high radar ρ surfaces on Venus [*Pettengill et al.*, 1982].

Map Patterns and Statistics

The global distribution of radar ρ is shown in map form (Mercator projection) in Plate 1. Areas of interest include the high ρ units ($\rho > 0.20$) associated with major mountains such as Maxwell, Atla, Theia, and Ovda as well as with a broad area to the west of Atalanta Planitia (for geographic place names refer to *U.S. Geological Survey* [1984] map). Figure 1 illustrates all three PV radar data sets with reflectivity at the bottom. The three subdivisions of ρ discussed in the previous section are used. By comparing the map of topography with that for ρ in Figure 1, it is clear that ρ is less well correlated with elevation than roughness (middle map). It is difficult to distinguish any of the major topographic features except for the highest mountains in the reflectivity map (Plate 1 and bottom of Figure 1). The low ρ regions (dark gray in Figure 1) do not occur as isolated areas and appear to be distributed at all elevation levels (cf. *Peterfreund et al.* [1984] for a more detailed description of map pattern units for all of the PV radar data sets). The low ρ surfaces are likely to have an appreciable soil cover, yet these regions are not obviously related to highlands in a pattern (e.g., flanking) that might suggest weathering and sediment transport or volcanic ash dispersal and deposition.

The frequency and cumulative distributions of the reflectivity data set are presented in Figure 2. The frequency distribution is unimodal and skewed very slightly toward higher values (Table 2). Only ~15% of the planet's surface has low enough ρ values to indicate a major soil (high porosity) component on the surface. This is in stark contrast with the moon and Mars where ρ values at similar radar wavelengths are almost universally less than 0.10 [*Tyler and Howard*, 1973; *Tyler et al.*, 1976]. This observation indicates the apparent absence of a globally continuous regolith or eolian mantling deposit on Venus, such as might be produced from processes including impact cratering, explosive volcanism, or chemical weathering. The range of ρ values, however, does not preclude any of these processes from occurring on Venus to some degree.

The global mean reflectivity is 0.13, with a standard deviation of 0.057 (approximately the same as the formal error) [*Pettengill et al.*, 1982]. The median is 0.122, a value which falls below the mean by a statistically insignificant amount. The primary mode is 0.11 which is also less than the mean. A two-stage Gaussian distribution can be used to fit the global ρ frequency distribution at a confidence level of 0.98. The two-stage Gaussian fit has the same modes (which serve as the mean values for the separate stages) as the original data. The fact that these modes are so near one another and within less than 1σ from the mean (0.13) indicates that there is no statistically meaningful separation of the ρ population into subgroups. Thus there is no means of separating distinct ρ subpopulations from one another on a global scale, in contrast with

TABLE 2. General Statistics for Radar Reflectivity

Parameter	Value
Mean	0.13
Standard deviation	0.057
Median	0.122
Mode(s)	0.114 (0.132)
Kurtosis*	7.24
Skewness (median)†	0.44
Skewness (mode)‡	0.87
Best fit, Gaussian§	
Mean	0.132
Standard deviation	0.055
R^2	0.92
Best fit, log-hyperbolic	
Mean	0.129
Standard deviation	0.057
R^2	0.98

*Kurtosis (spread of data) = $\alpha_4 = m_4/(m_2)^2 = [(1/n)\ \Sigma_i\ w_i\ (x_i - \text{mean})^4]\{[(1/n)\ \Sigma_i\ w_i\ (x_i - \text{mean})^2]^2\}^{-1}$.

†Skewness about the median $Sk_2 = 3$ (mean − median)/standard deviation.

‡Skewness about the mode $Sk_1 = 3$ (mean − mode)/standard deviation.

§Best fit of a given distribution to global data set where mean, standard deviation are for the fit and R^2 measures degree of correlation between fit and data.