Optical Polarization of Venus

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Observations were made of the wavelength dependence (from 0.3–1.0 μ) and phase angle dependence of the polarization of the disk of Venus. Near dichotomy the polarization was mapped over the disk at several wavelengths.

Two light-scattering mechanisms are indicated: a small contribution (3400Å optical depth $\sim$0.07) by Rayleigh scattering from molecules (or small particles), and scattering from an aerosol layer. After removing the Rayleigh effects, the observations were compared with Mie calculations for single scattering from size distributions of spheres. The principal effect of multiple scattering is a dilution of the polarization of single scatterings. The computed patterns of zero polarization (plotted on particle size-scattering angle maps) show smooth variations as a function of refractive index. To agree with the observed patterns, the particles must have a real refractive index >1.43 and diameters 2.5 ± 0.5 μ. Liquid water clouds are thus inconsistent with the observations. Lyot's telescopic and laboratory observations are supported by this work. But spheres of a variety of refractive indices (including Lyot's suggested value of 1.33) can match the observations in *visible* light. It is the wavelength dependence of the scattered polarization that makes possible the discriminations between different scattering mechanisms and different refractive indices. More complete details will appear in a Ph.D dissertation (University of Arizona, 1968) and in the "Wavelength Dependence of Polarization" series in the *Astronomical Journal*.

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