Effect of Insoluble Sulfur on the Microphysics of the Sulfuric Acid Clouds of Venus

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Sulfur allotropes have been suggested (Toon et al. 1982) as a possible identity of the unknown short wavelength absorber that is evident in the region of the upper clouds of Venus. That work had examined the effects on the reflected spectrum of Venus from an absorbing core of sulfur allotropes within sulfuric acid cloud droplets. However, Young (1983) pointed out that elemental sulfur is not miscible in sulfuric acid, thus negating that hypothesis. Nevertheless, the chemical arguments made by Toon et al. (1982) for the existence of sulfur allotropes in the upper clouds of Venus remain valid; these particles are likely to interact with the sulfuric acid droplets also known to be present; and amorphous sulfur allotropes still absorb at wavelengths consistent with that exhibited by this unknown absorber. Young (1983) postulated a "gumdrop" scenario in which sulfur allotropes would accumulate on the surfaces of sulfuric acid droplets, like sugar grains on a gelatinous gumdrop. Such a coating will have implications for the ability of Venus cloud droplets to grow via coalescence proesses, possibly resulting in a difference between the size distribution of droplets that have enocuntered amorphous sulfur particles, and those that have not. Here we investigate with a microphysical model the changes in size distribution that would result from such an inhibition of coalescence efficiency due to a coating of droplets with sulfur; and predict whether the modelled differences would be detectable in measurements of reflected sunlight made by the UVI instrument on Akatsuki.

Refs: Toon et al., 1982, Icarus, 51:358; Young, 1983, Icarus, 56:568.

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