2001 DPS Meeting abstract submission

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Models of the Formation and Growth of Jovian Polar Haze Particles

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We present models for the formation, growth, and physical properties of the Jovian polar haze based on a gas-phase photochemical model for the auroral regions developed by Wong et al. (2000) [Ap. J. 534: L215-L217]. In this model, auroral particle precipitation provides an important energy source for enhanced decomposition of methane and production of benzene and heavier ring compounds. We find that at high altitude, A-4 (pyrene, a hydrocarbon consisting of four fused aromatic rings) should homogeneously nucleate to form tiny primary particles. At lower altitudes, A-3 (phenanthrene) and A-2 (naphthalene) heterogeneously nucleate on the A-4 nuclei. These particles subsequently grow by additional condensation of A-2 on the nucleated particles and by coagulation, and eventually sediment out to the troposphere. We have run our aerosol microphysical model assuming values ranging between 2 and 3 for the fractal dimensionality of aggregate particles formed by the coagulation process. The predicted range of altitudes where aerosol formation occurs, the mean size to which particles grow, and the overall aerosol loading are all found to be generally consistent with the data analyses of Tomasko et al. (1986), West (1988), Banfield et al. (1998), and Rages et al. (1999). Observations which would critically test the model will be discussed.

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Banfield et al. (1998), Icarus 134, 11-23. Rages et al. (1999), Icarus 139, 211-226. Tomasko et al. (1986), Icarus 65, 218-243. West (1988), Icarus 75, 381-398.

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