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Condensation of Pluto's Minor Atmospheric Constituents

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The New Horizons missions has brought us many new insights into conditions in Pluto's atmosphere. Trace species such as C2H6, C2H2, C2H4 and HCN have been confirmed. Given the entry and exit temperature profiles measured by the spacecraft as well as the abundances of these species, each (along with CH4) will be highly supersaturated near Pluto's surface. A Pluto version of CARMA (Community Aerosol and Radiation Model for Atmospheres) has been constructed to model the ices formed when these species condense onto haze particles present in the atmosphere. All of the above listed species will nucleate onto the haze particles for the entry temperature profile, whereas only C2H6, C2H2, and HCN nucleate using the higher surface temperature exit profile. HCN ices form at the highest altitudes $\sim$15 km above the surface. C2H6 and C2H2 ices form at similar altitudes, 8-10 km at the entry site and below 5 km at the exit site. CH4 and C2H4 ices only form near the surface at the entry site. The cold temperatures near Pluto's surface play an important role in the efficiency of the nucleation and subsequent condensation processes, controlling the number and size of the ice particles.