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Incorporation of volatiles into clathrate hydrates on Pluto and Triton

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We use a statistical thermodynamic approach to determine the relative abundances of guests in clathrate hydrates which may form from a multiple compound gas whose composition is similar to those of the atmospheres of Pluto and Triton. We consider different values of the methane, carbon monoxide, nitrogen, argon, krypton and xenon abundances that may be representative of the early atmospheres of Pluto and Triton. We then investigate the trapping efficiencies of various compounds sequestrated in clathrate hydrates assumed to be formed at the atmosphere-surface interfaces of these bodies as a function of seasonal changes and orbital evolution. We quantify the amount of the various gases trapped as a function of the amount of clathrate formed in the crust, and propose observational tests that will allow future spacecraft missions to assess the plausible presence of clathrate hydrates in these environments.