



The seasonal atmospheric mass transfer process of the Pluto-Charon system

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Because of its highly eccentric orbit, Pluto's nitrogen-rich atmosphere driven by surface sublimation is subject to strong modulation effect as it moves from aphelion to perihelion (1989 last time). The New Horizons flyby mission in 2015 showed that even though the nitrogen atmosphere was colder than expected and the nitrogen escape rate was much reduced, the CH₄ escape process was quite robust. The New Horizons observations further indicated that a significant amount of the methane molecules could be transferred to Charon's water-ice rich surface. In this study, the Direct Monte Carlo Simulation (DSMC) method is used to demonstrate how such mass transfer process is made possible by molecular collision effect in Pluto's extended exosphere. The corresponding seasonal effect because of Pluto's orbital motion is also explored.