



A model study of the vertical distributions and escape fluxes of the major and minor species in Titan's thermosphere under different conditions

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From the measurements of the Ion Neutral Mass Spectrometer (INMS) on the Cassini spacecraft at different close encounters with Titan, it is known that the vertical temperature profile and density distributions of N₂, CH₄, H₂ and other species could have large variations which might be driven by environmental effects such as solar radiation and magnetospheric interaction. For example, the atmospheric temperature as determined from the N₂ density profiles can vary between 120 K and 175 K. Following the treatment of Li et al. (PSS, 104 (2014) 48-58) by applying a non-monotonic eddy diffusivity profile, we compute the vertical distributions of different species between Titan's surface to 2000 km altitude, for a range of atmospheric temperatures. Intercomparison between the model results and observations leads to better understanding of the production mechanisms of the minor species like C₂H₂, C₂H₄, C₂H₆ and others, all important to the hydrocarbon budgets of Titan's atmosphere and surface, respectively. Furthermore, such detailed photochemical calculations will also yield accurate estimates of the escape fluxes of H, H₂ and CH₄ into the circum-planetary region.