Study of trace species in the atmosphere of Titan

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Résumé

In Titan, the two major gases nitrogen (N2) and methane (CH4) are photolyzed by the sunlight and the energetic particles from Saturn's magnetosphere, resulting in rich atmospheric chemistry and a wide variety of carbon and nitrogen-bearing atmospheric compounds. In the present work, we focus on studying their vertical profiles to obtain a better insight into the atmospheric processes taking place on Titan. To do so, we reanalyze the data from the Gas Chromatograph Mass Spectrometer on the Huygens probe. The spectrometer sampled for nearly three hours from a height of 146 km to the surface. Huygens GCMS data have been recalibrated to account for deadtime and saturation corrections to the measurements, boundary conditions for the species, and sensitivity measurements from Cassini-Ion and Neutral Mass Spectrometer calibrations. We then analyze the recorded mass spectra using Monte-Carlo deconvolution simulations to retrieve minor compounds' vertical profiles. The simulations allow us to vary the peak intensities of fragmentation patterns of known species, which usually bear uncertainties in this kind of data. Then we use a least-square fitting to deconvolve the mixed signals. In the future, we plan to extend this study to develop a sub-surface model of Titan which will help us understand the outgassing of methane that was observed by the probe upon its touchdown on the surface. Then we use a least-square fitting to deconvolve the mixed signals. In the future, we plan to extend this study to develop a sub-surface model of Titan which will help us understand the outgassing of methane that was observed by the probe upon its touchdown on the surface. Then we use a least-square fitting to deconvolve the mixed signals. In the future, we plan to extend this study to develop a sub-surface model of Titan which will help us understand the outgassing of methane that was observed by the probe upon its touchdown on the surface.

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