EPSC Abstracts,
Vol. 4, EPSC2009-754, 2009
European Planetary Science Congress,

Composition of the lakes of Titan

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Abstract

More than one hundred radar-dark patches interpreted as lakes have been discovered in the north and south polar regions of Titan (Stofan et al. 2007; Hayes et al. 2008; Turtle et al. 2009). We have estimated the composition of these lakes by using the direct abundance measurements from the Gas Chromatograph Mass Spectrometer (GCMS) aboard the Huygens probe and recent photochemical models based on the vertical temperature profile derived by the Huygens Atmospheric Structure Instrument (HASI). Thermodynamic equilibrium is assumed between the atmosphere and the lakes, which are also considered as nonideal solutions. We point out that the composition of the lakes does depend on the latitude at which they formed. A lake existing at the latitude of the Huygens landing site would contain 79.5% of C_2H_6, 7.7% of C_3H_8, 5.5% of CH_4, 2.9% of HCN, 1.5% of C_4H_8, 1.3% of C_4H_{10}, 1.2% of C_2H_2, 0.3% of N_2 and 0.1% of CH_3CN. A lake formed at the poles would contain 76.4% of C_2H_6, 9.7% of CH_4, 7.5% of C_3H_8, 2.1% of HCN, 1.4% of C_4H_8, 1.2% of C_4H_{10}, 1.1% of C_2H_2, 0.5% of N_2 and 0.1% of CH_3CN. Other components are quantitatively negligible.

References

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