AOGS 2005

Constraints on Titan's atmospheric composition from Huygens Surface Science Package measurements

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On January 14 the Huygens probe descended through Titan's atmosphere and landed on the surface. The Surface Science Package SSP1 consists of a suite of sensors with the primary aim of analysing Titan's surface. Most of these sensors were also switched on during the descent and made valuable contributions to Huygens' scientific objectives. For example, SSP measured speed of sound and thermal conductivity continuously during the descent. We can solve the nonlinear inverse problem of deriving the relative abundances of a set of candidate gases in Titan's atmosphere given SSP's measurements of speed of sound and thermal conductivity and measurements of pressure and temperature. In order to model the gas mixture, our method relies on the Peng{Robinson equations of state. Of course, the sensitivity to the mixture composition is limited. Given the limited sensitivity of thermal conductivity and speed of sound to the composition of the gas we discuss to what degree SSP measurements can help us constrain Titan's atmospheric composition. We compare our results to an analysis by Rosenberg et al.[2].

References

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