

The Cassini-Huygens Probe Gas Chromatograph Mass Spectrometer (GCMS) Experiment. First Results.

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Abstract

The Huygens Probe of the Cassini Huygens Mission entered the atmosphere of the moon Titan on January 14, 2005. The GCMS was part of the instrument complement on the probe to measure in situ the chemical composition of the atmosphere during the probe descent and to support the Aerosol Collector Pyrolyzer (ACP) experiment by serving as detector for the pyrolyzation products. The GCMS collected data from an altitude of 146 km to ground impact for a time interval of 2 hours and 37 minutes. The Probe and the GCMS survived the ground impact and collected data for 1 hour and 9 minutes on the surface in the near surface environment until signal loss by the orbiter.

The major constituents of the lower atmosphere were found to be N₂ and CH₄. The methane-mixing ratio was found to increase below the turbopause, about 35 km altitude, monotonically toward the surface to levels near saturation. After surface impact a steep increase of the mixing ratio was observed suggesting evaporation of surface condensed methane due to heating by the GCMS sample inlet heater. Other constituents were found to be in very low concentrations, below ppm levels. The presence of Argon 40 was confirmed. The results for the other noble gases are still being evaluated. Other hydrocarbons and nitriles were also observed and quantitative evaluation is in progress. Preliminary ratios for the major carbon and nitrogen isotopes were computed from methane and molecular nitrogen measurements.

The instrument collected 5634 mass spectra during descent and 2692 spectra on the ground over a range of m/z from 2 to 141. Eight gas chromatograph samples were taken during the descent and two on the ground.