

Titan's aerosols properties determined with the Aerosol Collector and Pyrolyzer experiment of the Huygens probe

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Titan's organic aerosols play a significant role in the physical properties of the atmosphere, and the subsequent meteorology, the properties of the surface where they can have accumulated in significant amounts, and in the cycle of the organic matter of the Saturn's satellite which is of primary importance from an astrobiological point of view. However, the amount of direct data dealing with the Titan's aerosols properties is quite low, and the data recovered from the Cassini and the Huygens probes should significantly enhance our knowledge about these particles. Except some spectral data that should provide morphological and some indirect compositional information on the aerosols, the first in situ compositional data were recovered by the Aerosol Collector and Pyrolyser (ACP) experiment of the Huygens probe. This experiment collected two distinct atmospheric samples over separate altitude ranges (130-35 km and 25-20 km, respectively) during the Huygens probe descent. The samples were pyrolysed (heated up to 600°C) separately and the gases evolved from the samples were analysed with the Gas Chromatograph/Mass Spectrometer (GCMS) instrument of the Huygens probe, primarily devoted to the analysis of atmospheric gases. From the results of the chemical analysis of the collected aerosols by pyrolysis at 600°C, it was clearly shown that the aerosol particles include a solid organic refractory core. Moreover NH₃ and HCN were the first identified fingerprints of the chemical structure of the complex organics constituting this core, proving the inclusion of nitrogen in the process for the formation of Titan's aerosols. In this paper, we will present the results of the investigation of the pyrolysis of the aerosols at 600°C, as well as the results of further investigations led on the intermediary heating steps (at 30°C and 250°C).