Characterization of low frequency electromagnetic waves of Titan's cavity as revealed by the Huygens Probe

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The descent of the Huygens Probe through the atmosphere of Titan provided information for the characterization of the electrical environment of the largest moon of Saturn, for an altitude range not resolved with remote sensing or propagation techniques. The Permittivity, Waves, and Altimetry (PWA) analyzer, a subsystem of the Huygens Atmospheric Structure Instrument, measured the electric field in the bandwidth 0-10 kHz for altitudes lower than $\sim$140 km, where significant features have been identified. A narrow band wave emission at around 36 Hz, which lasts throughout the whole descent, is reminiscent of a resonance generated by a source that pumps

the cavity formed by Titan and the inner boundary of the ionosphere.

The aim of this work is to study the electromagnetic features identified in the PWA data, to determine correlations with the attitude of the Huygens Probe during descent through the atmosphere, to compare the results with related data provide by other instruments, and to test different cavity scenarios of the global electric environment. Furthermore, the nature of the resonant signal is analysed and the properties of the propagation of extremely low frequency electromagnetic waves inside the cavity are described, namely those coupled with pumping mechanisms that can be related with lightning activity.