

## Atmospheric electricity measurements on Titan with the PWA-HASI instrument on the HUYGENS Probe

## M. HAMELIN<sup>1</sup>, V. J. G. BROWN<sup>2</sup>, C. CHABASSIÈRE<sup>3</sup>, P. FALKNER<sup>4</sup>, F. FERRI<sup>5</sup>, M. FULCHIGNONI<sup>6</sup>, R. GRARD<sup>7</sup>, R. HOFE<sup>8</sup>, I. JERNEJ<sup>8</sup>, L. LARA<sup>2</sup>, J. J. LOPEZ-MORENO<sup>2</sup>, G. MOLINA-CUBEROS<sup>9</sup>, R. RODRIGO<sup>2</sup>, K. SCHWINGENSCHUH<sup>8</sup>, F. SIMÕES<sup>1</sup> and R. TRAUTNER<sup>7</sup>

<sup>1</sup>Centre d'etude des Environments Terrestre et Planetaires (CETP), CNRS, France
<sup>2</sup>Instituto de Astrofisica de Andalucia (IAA), CSIC, P.O. Box 3004, E-18080 Granada, Spain
<sup>3</sup>Laboratoire de Physique et Chimie de l'Environnement (LPCE), CNRS, France
<sup>4</sup>Science Payload and Advanced Concepts Office, ESA/ESTEC, Noordwijk, The Netherlands
<sup>5</sup>Centro Interdipartimentale Studi ed Attività Spaziali 'G. Colombo' Via Venezia 15, Italy
<sup>6</sup>Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA), Observatoire de Paris – France

<sup>7</sup>Research and Scientific Support Department (RSSD), ESA/ESTEC, Noordwijk, The Netherlands

<sup>8</sup>Institut für Weltraumforschung (IWF), Austrian Academy of Sciences, Austria <sup>9</sup>Dpto. Fisica, Facultad de Quimicas, Universidad de Murcia, Murcia 30100, Spain

The successfull descent of the HUYGENS Probe and landing on Titan was a key event of the CASSINIHUYGENS mission (NASA/ESA/ASI). Penetrating under the ionospheric top level HUYGENS revealed Titan's atmospheric electricity characteristics that were unaccessible from outside observation even from the CASSINI orbiter.

We present first the PWA instrument (Permittivity Waves and Altimetry), a subsystem of HASI (HUYGENS Atmospheric Structure Instrument) built by a group of european laboratories. This versatile instrument measures the conductivity of the atmosphere with two complementary sensors, a mutual impedance (MI) probe and a relaxation probe (RP) that measures also DC and AC electric fields in passive mode. PWA includes also acoustic measurements, processing of the radar altimeter data to investigate the terrain roughness and electrical characteristics, and last but not the least ground complex permittivity measurements using the mutual impedance probe in a special surface mode.

We review the preliminary results that reveal the lower ionosphere peak of electron density deduced from our conductivity measurements of both the MI and the RP sensors. The experimental results are compared with previous theoretical models. The conductivity due to positive ions was also measured by RP; conductivity values derived from the measurements are unexpectedly below various model predictions.

Electromagnetic waves data were analysed to search for clues of lightning activity on Titan. The results are presented briefly as well as the results of surface permittivity measurements; both topics will be presented in detail in companion posters.