Abstract *(paper not available)*

Micro-ARES, the Electric Field and Conductivity Sensor for ExoMars 2016: Atmospheric Interaction Simulations

Sandy Cardnell[1], Olivier Witasse[1], Fabrice Cipriani[1], Grégoire Déprez[2], Franck Montmessin[2], Jean-Jacques Berthelier[2], Andrew Ball[1], Francesca Esposito[3],

[1]ESA/ESTEC (The Netherlands); [2]CNRS-LATMOS (France); [3]INAF-OAC (Italy)

Since 2011, LATMOS has been involved in the development of Micro-ARES, an electric field and conductivity sensor forming part of the DREAMS science payload of the ExoMars 2016 Schiaparelli entry, descent and landing demonstrator module (EDM). Micro-ARES is dedicated to the very first measurement and characterization of Martian atmospheric electricity. The instrument, a compact version of the ARES instrument for the former ExoMars Humboldt payload, is composed of an electronic board, with an amplification line and a real-time data processing Digital Signal Processor. To measure DC and AC electric fields, it uses the principle of a relaxation probe which measures the potential difference between the spherical electrode (located at the top of a 27-cm high antenna) that adjusts itself to the local atmospheric potential, and the lander structure, connected to the ground. It also has a relaxation mode used to measure the atmospheric conductivity, in which a sudden increase or decrease is introduced in the potential of the electrode, after which the electrode recovers to its equilibrium. The relaxation time is a function of the atmospheric conductivity. The lower Martian atmosphere contains various charged species, such as positive and negative ions, electrons and charged aerosols, in non-negligible concentrations. These charged species, together with the neutral background gas, can be considered as a weakly ionised, collision-dominated plasma in thermal equilibrium. The proper data processing and interpretation depends strongly on reliable modelling of the interaction between the instrument and the lander with the surrounding plasma. Also, the effects of surface charging and the interaction with charged dust must be considered. Furthermore, the model also has to include the instrument input electronic circuit to take the input current at the electrode into account, as well as an instrument program mimic in order to properly reproduce the instrument behaviour over time. Once validated, the base model will be run successively with a large set of input parameters such as atmospheric conductivity, electric fields profiles over time, lander position, etc. The final set of results will have to be large enough to enable an optimisation of those input parameters over the experimental data, in order to retrieve the key scientific parameters which are the atmospheric conductivity and electric field.

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