EPSC Abstracts
Vol. 12, EPSC2018-417, 2018
European Planetary Science Congress 2018

Comparative aeronomy of cometary and planetary ionospheres: solar energy deposition and plasma loss

Arnaud Beth
Department of Physics, Imperial College London, Prince Consort Road, London SW7 2AZ, United Kingdom (abeth@ic.ac.uk)

Abstract

European Space Agency (ESA) missions Giotto and Rosetta offered us the best opportunities to probe the cometary ionospheres of 1P/Halley and 67P/Churyumov-Gerasimenko. During the 2-year Rosetta escort phase, different conditions were encountered at 67P and played a key role in the structure and variability of its ionosphere: strong variation in the outgassing rate and in the ionization frequency by extreme ultraviolet solar radiation, for instance. In particular, Rosetta spotlighted that 67P is very different from 1P.

Cometary environments are atypical of planetary ones. Their gaseous envelopes – comae – are neither gravitationally bounded to the surface nor in hydrostatic equilibrium. Actually, comae result from the sublimation of ices turned into gas which expands into the space vacuum at several hundred metres per second. The lack of gravity leads to an unprecedented and unpredicted feature for cometary ionospheres: the maximum of solar energy deposition does not occur at the same optical depth as what is observed in planetary ionospheres.

During this presentation, I will contrast the structure of cometary ionospheres with planetary ones. First, I will focus on the production of photo-electrons and its altitude profile for both cases. Secondly, I will show how it is impacted by the cometary activity, and how it varies with the heliocentric distance. Finally, I will address the consequences on the electron number density profile. Especially, I will spotlight and cover the relevant processes ongoing in the cometary ionospheres under different conditions encountered at comet 1P during Giotto and comet 67P during the Rosetta escort phase.