



Relevance of the electron-ion recombination in cometary ionospheres: Comparison between 1P/Halley and 67P/Churyumov-Gerasimenko

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Recombination between electrons and positive ions within the dense ionosphere of very active comets, such as 1P/Halley, is the major plasma loss mechanism. The total plasma number density profile has been derived assuming pure photo-chemical equilibrium (Cravens, 1986) and has been largely used in the past literature since, including the estimation of the diamagnetic cavity. However, at 67P/Churyumov-Gerasimenko, at large heliocentric distances the cometary ions are mainly lost through transport while recombination is negligible. This leads to a different profile for the total plasma number density (Galand et al., 2016). Gombosi (2015) considered both recombination and transport in a cometary ionosphere but assumed a point source-like comet.

We propose here an analytical approach to reconcile both the pure photo-chemical and pure-transport asymptotical profiles, without compromising on the size of the comet. We will evaluate the error on the plasma number density by considering one of the assumptions, as a function of different parameters, such as the outgassing rate, the ionisation frequency, the electron-ion recombination rate and the ion velocity. Finally, we will discuss the further implications on the derived parameters, such as the size of the diamagnetic cavity.