

# Particle Simulations on Near-Spacecraft Plasma Perturbations in Polar Ionospheric Environment

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This paper reports the international collaborative project on spacecraft-plasma interactions in the Polar ionospheric environment, which is initiated by Kobe University and University of Oslo. It is widely known that plasma density irregularities with various spatial scales are generated frequently in the ionospheric environment. A series of ICI rockets have been launched from Norway for studying such ionospheric phenomena. One of the outstanding issues regarding the rocket experiments is near-spacecraft plasma perturbations, possibly influencing the in-situ observations. We applied the 3-dimensional plasma particle simulations to the problem, in order to have better understanding of such processes.

Our preliminary results confirmed 1. rocket surface potential depending on an angle between the geomagnetic field and the rocket axis and 2. asymmetric wake structure due to strong magnetization of plasma electrons. We analyzed their associated electron dynamics around the rocket and found that electron motion creates a circular current center at the body, which may be attributed to the  $E \times B$  drift as well as the diamagnetic effect. We have also started a numerical study on frequency spectra of potential fluctuations and their relevance to plasma wave modes near a spacecraft/rocket.

Keywords: Polar ionospheric plasma, sounding rocket, spacecraft charging, wake, PIC simulation