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Effects on plasma and electric field measurements induced by spacecraft-plasma interaction

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The interaction between a moving spacecraft and the ambient plasma may induce significant disturbances on plasma and electric field measurements that need to be accurately taken into account in order to optimize the positioning of instruments and to correct the measurements. Two resulting effects are presented in this poster. The first one is related to bulk velocity measurements made onboard the DEMETER micro-satellite. Detailed calculation of the plasma sheath around the satellite have been made using the SPIS code developped under the responsibility of ESA in order to determine the possible effects of a non-plane ion sheath on the ion trajectories and the disturbance on their bulk velocity direction that is measured by the IAP ion analyzer. Results will be shown indicating that deviation of a few degree may be expected that need to be taken into account to interpret the observations.

A second observation will be presented dealing with an unexpected effect of the distant wake of the satellite. An anomaly aligned along the dip equator in the pacific sector observed by the electric field instrument on board was found related to an anomalous potential increase in one of the 4 probe. The local magnetic field line passing through the probe intersects with the satellite's wake region at 30m behind, neglecting converging/diverging effects of ions' ram motion. A simple but fast 2D Particle-In-Cell code, with an FFT Poisson solver, is developed to estimate the distant wake effects on the electrons' motion along the magnetic field line through the affected probe. Results from the simulation will be presented and its effects on the anomalous potential increase on the probe will be discussed.