



Improvements on field-aligned currents characterization with Swarm

Adrian Blagau (1,2), Joachim Vogt (1), Maosheng He (3,1)

(1) Jacobs University Bremen, Bremen, Germany, (2) Institute for Space Sciences, Bucharest-Magurele, Romania (blagau@space-science.ro), (3) Leibniz-Institute of Atmospheric Physics, Kühlungsborn, Germany

Field-aligned currents (FACs) are a key component of the magnetosphere-ionosphere system in the auroral region, providing the transfer of energy and momentum between the collision-free magnetospheric plasma and the collisional ionosphere. The ESA's Swarm mission provides a unique opportunity to explore the low altitude end of the FACs by a broad range of single- and multi-spacecraft techniques, able to improve the understanding of this complex current system.

At present, the Swarm FAC data products available to the end-user do not fully exploit this opportunity, for example the operating conditions for some techniques can be relaxed, other techniques are not used yet (notably, based on all three satellites), quality indicators on the underlying assumptions are missing. The presentation concentrates on the possibilities to maximize the use of magnetic field data to better characterize the FAC structures and pave the way to new FAC products. Notably, one proposes the use of an alternative approach to estimate the FAC densities, based on least squares (LS) minimization. Results obtained by carrying out extensive tests on the LS method, using both Swarm measurements as well as synthetic data, will be shown. The limitations and benefits of various FAC estimation methods will be discussed as well as how the approaches compare and complement one to each other.