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Magnetosheath jet interaction with ambient plasma

Ferdinand Plaschke (1,2), Maria Jernej (1), and Heli Hietala (3)

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria (ferdinand.plaschke@oeaw.ac.at), (2) Institute of Physics, University of Graz, Graz, Austria, (3) Department of Earth, Planetary, and Space Sciences, University of California Los Angeles, Los Angeles, CA, USA

The subsolar magnetosheath is frequently permeated by so-called high-speed jets, i.e. localized enhancements in dynamic pressure relative to the ambient plasma. Sometimes, the jets' dynamic pressure even surpasses that of the solar wind, upstream of the bow shock. Jet plasma is usually both faster and denser than ambient magnetosheath plasma. In a recent case study based on Magnetospheric Multiscale (MMS) measurements, it was suggested that fast jet plasma pushes slower ambient plasma out of the way, thereby stirring the ambient plasma and even creating anomalous (sunward) flows in the magnetosheath. Furthermore, a number of jets was found to be associated with magnetic fields that are more aligned with their propagation direction. We present results of two statistical studies that prove and quantify, for the first time: (i) the vortical plasma motion of ambient and jet plasma around faster jet core plasma and (ii) the straightening of the draped magnetosheath magnetic field along the direction of motion of that faster plasma. Both effects originate from the differential velocity between plasmas and occur systematically in/around jets ploughing through the magnetosheath. The statistical studies are enabled by multi-spacecraft jet observations by the Time History of Events and Macroscale Interactions during Substorms (THEMIS) and MMS probes.