



Detection of thin current sheets and associated reconnection in the Earth's turbulent magnetosheath using cluster multi-point measurements

Alexandros Chasapis (1), Alessandro Retino (1), Fouad Sahraoui (1), Antonella Greco (2), Andris Vaivads (3), David Sundkvist (4), and Patrick Canu (1)

(1) Laboratoire de Physique des Plasmas, CNRS/Ecole Polytechnique/UPMC/Univ. Paris Sud, Palaiseau, France (alexandros.chasapis@lpp.polytechnique.fr), (2) Dipartimento di Fisica, Universita della Calabria, Rende, Italy, (3) Swedish Institute of Space Physics, Uppsala, Sweden, (4) Space Sciences Laboratory, University of California, Berkeley, USA

Magnetic reconnection occurs in turbulent plasma within a large number of volume-filling thin current sheets and is one major candidate for energy dissipation of turbulent plasma. Such dissipation results in particle heating and non-thermal particle acceleration.

In situ observations are needed to study the detailed properties of thin current sheets and associated reconnection, in order to determine its importance as a dissipation mechanism at small scales. In particular, multi-point measurements are crucial to unambiguously identify spatial scales (e.g current sheet thickness) and estimate key quantities such as $E \cdot J$.

Here we present a study of the properties of thin current sheets detected in the Earth's magnetosheath downstream of the quasi-parallel shock by using Cluster spacecraft data. The current sheets were detected by the rotation of the magnetic field as computed by four-point measurements.

We study the distribution of current sheets as a function of the magnetic shear angle θ , their duration and the waiting time between consecutive current sheets. We found that high shear ($\theta > 90$ degrees) current sheets show different properties with respect to low shear current sheets ($\theta < 90$ degrees). These high-shear current sheets account for about $\sim 20\%$ of the total and have an average thickness comparable to the ion inertial length. We also compare our four-point detection method with other single-point methods (e.g. Partial Variance of Increments – PVI) and we discuss the results of such comparison.