Geophysical Research Abstracts
Vol. 21, EGU2019-8561, 2019
EGU General Assembly 2019

Generation of magnetic holes in Kelvin-Helmholtz instability in magnetized plasmas

Francesco Pucci (1), Pierre Henri (2), Francesco Califano (3), Sergio Servidio (4), Matteo Faganello (5), Thierry Passot (6), Pierre-Louis Sulem (6), and Giovanni Lapenta (1)

(1) Department of Mathematics, KU Leuven, Heverlee, Belgium, (2) LPC2E, CNRS, Orléans, France, (3) Department of Physics, University of Pisa, Pisa, Italy, (4) Department of Physics, University of Calabria, Arcavacata di Rende, Italy, (5) INSIS, University of Aix-Marseille, Marseille, France, (6) Laboratoire Lagrange, OCA, CNRS, Université Côte d'Azur, Nice, France

Velocity shear driven vortices associated to the Kelvin-Helmholtz instability (KHI) have been detected by in-situ observations at the Earth, Saturn and Mercury magnetospheres' boundary due to the interaction with the solar wind. KHI in magnetized plasmas have been widely studied numerically in the framework of a fluid and hybrid descriptions, while only very few studies have focused on the physics of electrons because of computational constraints. In this work we present a full kinetic particle in cell study of the KHI spanning a range of scales going from fluid to electron scales. Within this framework, we discuss the formation of ion-scale magnetic holes caused by the development of an electron mirror instability in the region of the velocity shear. The observed magnetic holes are pressure balance structure, in which the deep in magnetic pressure is balanced by a bump in the kinetic pressure. The latter is mainly provided by an high electron temperature in the direction perpendicular to the guide field. A diamagnetic electron current ring flowing inside the magnetic holes is also observed. Our work suggests a possible mechanism for the generation of the ion-scale magnetic holes recently observed by MMS in the Earth's magnetosphere.