Geophysical Research Abstracts
Vol. 19, EGU2017-11995, 2017
EGU General Assembly 2017

Magnetic nulls in three-dimensional particle-in-cell simulations of turbulent plasmas.

Vyacheslav Olshevsky (1,2), Fabio Bacchini (1), Stefaan Poedts (1), and Giovanni Lapenta (1)

(1) KU Leuven, Center for mathematical Plasma Astrophysics, Department of Mathematics, Leuven, Belgium (sya@mao.kiev.ua), (2) Main Astronomical Observatory of NAS, Kyiv, Ukraine

Slurm, a new Lagrangian magnetohydrodynamic Particle-in-Cell solver developed at KU Leuven, is used to study magnetic nulls in turbulent magnetized plasmas. We model a classic hydrodynamic Taylor-Green vortex with superimposed magnetic field. Three different configurations of the magnetic field are used and compared with each other, and with the kinetic particle-in-cell simulations of the same configurations. The kinetic simulations are performed by the fully kinetic electromagnetic code iPic3D.

We apply the topological degree method to identify magnetic nulls in our simulations. In all three cases, the number of nulls is evolving with time and shows a distinct peak at the moment of maximum energy dissipation. In two cases, the fraction of magnetic nulls of the spiral topological type is high, about 80% of the total number of nulls. On contrary, in the third magnetic field configuration the fraction of spiral nulls is low and is decreasing with time. Processes associated with magnetic reconnection at null points may influence turbulent energy dissipation in magnetized plasmas.