



## **Three-dimensional numerical simulations of anisotropic turbulence induced by magnetic reconnection**

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Magnetic reconnection was often invoked as an explanation for different kinds of impulsive events in astrophysical plasmas. The evolution of reconnection instability gives origin to a nonlinear cascade through the development of turbulence. This phenomenon is believed to be a good candidate for explaining the properties of the spectra observed, for instance, in Earth's magnetotail.

The turbulence produced by magnetic reconnection has peculiar characteristics with respect to that induced in homogeneous and isotropic magnetic configurations. The presence of an inhomogeneous direction, in fact, naturally leads to anisotropic spectra and the energy cascade is mainly in direction perpendicular to the local equilibrium magnetic field.

In this work we present the results of three-dimensional numerical simulations, concerning the nonlinear evolution of an initially tearing-unstable current sheet. The code solves the incompressible magnetohydrodynamics (MHD) equations, by using parallelization techniques through Message Passing Interface (MPI). The initial conditions represents a sheared magnetic configuration (with a constant guide field), perturbed by a superposition of fluctuations with different resonant surfaces.

The results show that, as a consequence of reconnection instability, a competition among two- and three-dimensional modes is observed which leads to a turbulent state and coalescence of magnetic islands. We analyzed the anisotropy properties of the generated spectra. The results show that in the portion of the domain where the mag-

netic field is more homogenous, the anisotropy direction of the spectrum is mainly perpendicular to the local, background, magnetic field, as a consequence of the Alfvén effect. On the converse, near to the current sheet, the shape of the spectrum is also affected by the shape of the unstable modes.

This peculiar phenomenology can also be useful for the identification of reconnection events taking place in space plasmas under several conditions.