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Diffusion of magnetic field and plasmas enabled by magnetic reconnection

Alexander Lazarian
University of Wisconsin, Dept. Astronomy, Madison, United States (lazarian@astro.wisc.edu)

It is well known that magnetic fields constrain motions of charged particles and limit their diffusivity perpendicular to magnetic field lines. I shall discuss how the process changes in turbulent fluids where magnetic reconnection enables magnetic fields to change topology and allows plasma to flow perpendicular to the direction of the mean magnetic field. As a result, diffusion perpendicular to magnetic field gets dependent on the intensity of MHD turbulence. I shall discuss an intrinsic connection of the magnetic diffusivity in turbulent fluids and the magnetic reconnection rates. The consequences of the process include efficient heat transport in collisionless plasmas with extensive astrophysical consequences that I am going to discuss. The examples span from plasmas in clusters of galaxies to the magnetosphere.