Fast magnetic reconnection onset for different equilibrium configurations: from analytical results to 3D simulations

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We investigate the onset of fast magnetic reconnection starting from equilibrium configurations relevant for astrophysical as well as for laboratory plasmas, that differ from the simple Harris current sheet configuration. In particular we present an analytical as well as a numerical study of the linear instability for equilibrium magnetic fields which go to zero at the boundary of the domain and of a double current sheet system, the latter previously studied as a proxy for the m=1 kink mode in cylindrical plasma. We show how the "ideal" tearing trigger condition is changed by assuming such different equilibrium profiles. Finally we present results for incompressible 3D MHD simulations of a double current sheet, in triperiodic geometry. We examine and contrast the destabilization and transition to turbulence describing the evolution of the magnetic energy and dissipation, and possible application to heliospheric phenomena, in particular CME evolution and relaxation.

Keywords: plasma physics, space plasma, magnetic reconnection

