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Gyrokinetic Studies of Magnetic Reconnection MORITZ J. PUESCHEL, FRANK JENKO, DANIEL TOLD, Max Planck Institute for Plasma Physics, JOERG BUECHNER, Max Planck Institute for Solar System Research —
Collisionless magnetic reconnection constitutes an effective mechanism for particle acceleration in astrophysical plasmas, in particular the solar corona. In addition, it is also of relevance to fusion experiments. Gyrokinetic simulations with the GENE code are performed to explore the temporal evolution of current sheets in two-dimensional slab geometry with a strong guide field. After successful code-code benchmarking, Extensive parameter studies are performed, covering a wide range of physical scenarios. In particular, differing findings regarding the influence of the ion temperature are explained. In its nonlinear phase, the characteristics of the reconnection process depend on whether the system is driven or decaying. Decaying turbulence sees an inverse cascade, and all energy is ultimately transferred to the largest radial scale. If driven by a Krook-type term, the system develops into a turbulent, quasi-stationary state. An important quantity to investigate in nonlinear simulations is the parallel electric field which is able to accelerate particles along the background magnetic field. The spatial structure of this field is studied for the different nonlinear cases, and its amplitude reported as a function of the drive frequency.

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