Energy partition in kinetic turbulent reconnection

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Magnetic reconnection is a commonly observed fundamental process in both astrophysical and fusion plasmas. It allows topological change of magnetic field lines, and converts the free energy in the magnetic field into various forms of energy, such as bulk plasma flows, plasma heating, or non-thermal particle acceleration.

In weakly collisional plasmas, the phase mixing process caused by kinetic effects, such as Landau damping and finite Larmor radius effects, creates oscillatory structures in velocity space, which must eventually regularized by collisions. Therefore, even if collisions are infrequent, energy dissipation and resulting plasma heating may be significant, as demonstrated by recent investigations [1, 2, 3]. It has also been shown that, for high-β plasmas, the current sheet becomes unstable, and the resultant plasmoid can significantly alter the efficiency of electron and ion heating [3]. As shown in Fig. 1, the electron energy dissipation and heating are re-activated at the newly formed X-point when the plasmoid is ejected from the reconnection site.

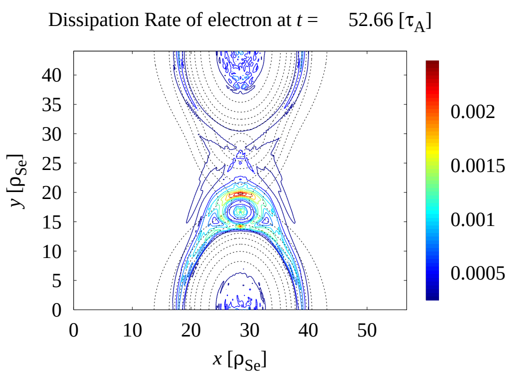

Figure 1: *Electron energy dissipation rate when plasmoid is generated.*

In this work, we externally drive the system, and discuss effects of plasmoids on ion/electron heating during magnetic reconnection with turbulence.

References

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