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[Secondary Island Formation in Numerical Simulations of Magnetic Reconnection in Resistive MHD under Laminar or Turbulent Conditions](#)

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Recently, secondary island formation due to the tearing instability of the Sweet-Parker current sheet was identified as a possible mechanism that can lead to fast reconnection (less sensitive dependence on Lundquist number S) both in numerical simulations using Particle-in-Cell (PIC) method [Daughton et al. 2009], as well as using resistive magnetohydrodynamics (MHD) [Lapenta 2008; Bhattacharjee et al. 2009]. This instability is thought to appear when S is greater than a certain threshold. These recent results prompt us to perform more resistive MHD simulations of a basic reconnection configuration based on the island coalescence instability, using much higher resolutions and larger S , since secondary island formation has not been observed before for S smaller than the order of 10^4 . Our simulations are based on a fairly standard pseudo spectral code, which has been well tested for accuracy, convergence, and compared well with codes using other methods [Ng et al. 2008]. Based on the experience in our simulations, we argue that a highly accurate simulation is important since secondary islands have been observed to form due to numerical inaccuracy. Latest results based on simulations with S up to 2×10^5 will be presented, as well as simulations superimposed with turbulence. This work is supported by a NASA grant NNX08BA71G, and NSF.

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