2010 SHINE Workshop Abstract Info Preview

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Title of Poster/Presentation: High Lundquist Number Resistive MHD Simulations of Laminar or Turbulent Magnetic Reconnection: Conditions for Secondary Island Formation and Fast Reconnection

Abstract: 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 the 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 (~10^4). 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 (up to 8192^2) and larger S (up to 2 x 10^5). 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]. It is found that the reconnection rate is consistent with the Sweet-Parker theory with no secondary island formation. However, secondary islands have been observed to form, with faster reconnection rate, due to numerical inaccuracy, as well as in simulations superimposed with turbulence. Latest results on the scaling of reconnection rate with turbulence level will be presented. This work is supported by a NASA grant NNX08BA71G, and a NSF grant AGS-0962477.

Session: When and How is Reconnection in the Solar Environment Turbulent?

Invited Paper: no

Student Paper: no

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