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Open Boundary Kinetic Simulations of Collisionless Magnetic Reconnection WILLIAM DAUGHTON, JACK SCUDDER, University of Iowa, HOMA KARIMABADI, UCSD — Kinetic simulations of magnetic reconnection typically employ periodic boundary conditions that limit the duration in which the results are physically meaningful due to the artificial recirculation of particles and magnetic flux. To address this issue, a new model was recently developed[1] that is open with respect to particles, magnetic flux and electromagnetic radiation. This new model is used to examine both *driven* and *undriven* reconnection in neutral sheet geometry. In both cases, the electron diffusion region does not remain microscopic, but expands in time to form an extended current layer. As a consequence, the electron diffusion region forms a bottleneck and the reconnection rate is substantially reduced. Periodically, the electron layer becomes unstable and produces a secondary island, breaking the diffusion region into two shorter segments. After growing for some period, the island is ejected and the diffusion region again expands until a new island is formed. These results indicate that reconnection in a neutral sheet may be inherently unsteady and raise serious questions regarding the standard model of Hall mediated reconnection.

[1]Daughton, Scudder and Karimabadi, *Phys. Plasmas* **13**, 072101, 2006

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