Abstract Submitted
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kglobal: A Computational Model for Electron Acceleration in Macroscale Systems[1] HARRY ARNOLD, JAMES DRAKE, MARC SWISDAK, University of Maryland, FAN GUO, Los Alamos, YI-MINH HUANG, Princeton University, JOEL DAHLIN, NASA Goddard Space Flight Center — We have developed a new computational model, kglobal, to explore energetic electron production via magnetic reconnection in macroscale systems. The model is based on the discovery that the production of energetic electrons during reconnection is controlled by Fermi reflection in large-scale magnetic fields and not by parallel electric fields localized in kinetic scale boundary layers. Thus, the model eliminates these boundary layers and does not need to resolve any kinetic scales. We use guiding center equations for macro-particle electrons that provides self-consistent feedback on the magnetic field and ion fluid through their anisotropic pressure tensor. Additionally, in order to ensure charge neutrality we include a fluid electron species as well. The result is a code with a MHD backbone that allows us to study electron energization while conserving the total amount of energy. This code has accurately simulated Alfvén waves, magnetohydrodynamic waves, the firehose instability, and Landau damping of electron acoustic modes. Here we present results from macroscale multi-island magnetic reconnection simulations, including evidence for a power law in the particle electrons. This model is capable of bridging the orders of magnitude gap between PIC simulations and global systems.

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