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A new MHD/kinetic model for exploring particle acceleration in macro-scale systems[1] JAMES DRAKE, HARRY ARNOLD, MARC SWISDAK, University of Maryland, College Park, JOEL DAHLIN, NASA Goddard Space Flight Center — A novel MHD/kinetic model, kglobal, is being developed to explore magnetic reconnection and particle energization in macro-scale astrophysical systems. The model blends the MHD with a macro-particle description. The rationale for this model is based on the discovery that energetic particle production during magnetic reconnection is controlled by Fermi reflection rather than parallel electric fields. Since the Fermi mechanism is not dependent on kinetic scales, the model is sufficient for describing particle acceleration in macro-systems. The kglobal model includes macro-particles laid out on an MHD grid that are evolved with the MHD fields. The feedback of the energetic component on the MHD fluid is included in the dynamics so total energy is conserved. The system has no kinetic scales and therefore can be implemented to model energetic particle production in macro-systems. It has been upgraded to include the macroscale parallel electric field required to describe return currents that develop in open systems. The new model has been benchmarked by studying the propagation of Alfvén waves and the growth of firehose modes in a system with anisotropic electron pressure. The first results on the exploration electron acceleration during reconnection will be presented.

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