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A discontinuous-Galerkin sparse-grid Fokker-Planck solver for runaway electrons MU LIN, DIEGO DEL-CASTILLO-NEGRETE, DAVID GREEN, Oak Ridge National Laboratory — The understanding and control of runaway electrons (RE) is a top priority of the fusion program because, if not avoided or mitigated, RE can severely damage the plasma facing components of ITER and future machines. There is thus a pressing need to develop accurate models of RE dynamics as well as efficient computational algorithms. The full kinetic description of RE requires the solution of high-dimensional (up to 6-D) partial differential equations. To address this challenging problem, Discontinuous Galerkin (DG) methods and Spare Grid (SG) techniques might offer a viable alternative to standard methods known to face shortcomings due to lack of good conservation properties and the "curse of dimensionality" To explore this alternative in a tractable setting we present a DG-SG solver for a 2-D Fokker-Planck model describing RE dynamics in energy and pitch angle phase space including electric field acceleration, collisions, and synchrotron radiation damping. The accuracy and conservation properties, as well as the numerical efficiency of the proposed method, are discussed in detail. Simulations illustrating RE physics are also presented along with preliminary ideas on extending the solver to higher dimensions.

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