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Global Hybrid Simulations of the Earth Magnetosphere: Nuts and Bolts H. KARIMABADI, H.X. VU, UCSD, D. KRAUSS-VARBAN, UC Berkeley, Y.A. OMELCHENKO, UCSD, J. RAEDER, University of New Hampshire — We present results of global 2-D and 3-D hybrid (electron fluid, kinetic ions) simulations of the Earth magnetosphere and compare them with equivalent MHD simulations. There are a number of numerical and modeling issues that may affect simulation results and special care must be taken to ensure proper modeling. We discuss these pitfalls through examples and present the appropriate choice of the boundary conditions, resistivity model, and hybrid algorithm, along with a number of new physical effects we have discovered. We have also performed the highest resolution global MHD simulations of the magnetosphere to date. We compare the computational hybrid and MHD models and show how these two tools can be used in a complementary fashion to advance our understanding of the underlying magnetospheric physics. Finally, we briefly discuss our progress in developing discrete-event simulation technology with the eventual goal of applying it to the 3-D global hybrid simulations.

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