TOWARDS OPENGGCM 4.0: SIMULATING THE GLOBAL MAGNETOSPHERE WITH RING CURRENT, RADIATION BELTS, PLASMASPHERE, AND HALL MHD

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The OpenGGCM is a global numerical model of geospace, covering the Earth's magnetosphere, ionosphere, and thermosphere. Although housed at the University of New Hampshire, it is a community model that is available to any researcher for runs on demand at the Community Coordinated Modeling Center (CCMC, http://ccmc.gsfc.nasa.gov). Like any numerical model it is not perfect and thus subject to continuous development work to add more physics, make it more robust, and to improve performance. In this presentation we will outline a number of ongoing improvements to the model. First, the OpenGGCM is being coupled with the RCM (Rice Convection Model) and CRCM (Comprehensive Ring Current Model) models of the inner magnetosphere. This coupling should improve the realism of the model close to Earth, where particle drift physics is important. The coupling is in both directions, where the RC models receive the ionosphere potential, the magnetic topology, and plasma parameters at the boundaries from the OpenGGCM, and in the opposite direction the OpenGGCM receives pressure and density in the inner magnetosphere, as well as field aligned current and e- precipitation. Second, we couple the NASA/GSFC RBM (Radiation Belt Model) to the OpenGGCM. In this case the coupling is only one way, i.e., the RBM receives particle sources and magnetic topology from the OpenGGCM. Third, we replace the current ionosphere-thermosphere module, CTIM, with the new GT-GIP, which also includes a self-consistent plasmasphere model. Finally, we replace the MHD formalism in the magnetosphere with a Hall-MHD formalism, which is primarily of importance for magnetic reconnection. The new upgraded model will eventually become version 4.0 at the CCMC.

Magnetosphere, ring current, radiation belt, ionosphere, plasmasphere, simulation

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