Modeling of the Convection and Interaction of Ring Current, Plasmaspheric and Plasma Sheet Plasmas in the Inner Magnetosphere

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Distinctive sources of ions reside in the plasmasphere, plasmasheet, and ring current regions at discrete energies constitute the major plasma populations in the inner/middle magnetosphere. They contribute to the electrodynamics of the ionosphere-magnetosphere system as important carriers of the global current system, in triggering geomagnetic storm and substorms, as well as critical components of plasma instabilities such as reconnection and Kelvin-Helmholtz instability at the magnetospheric boundaries. Our preliminary analysis of in-situ measurements shows the complexity of the plasmas pitch angle distributions at particularly the cold and warm plasmas, vary dramatically at different local times and radial distances from the Earth in response to changes in solar wind condition and Dst index. Using an MHD-ring current coupled code, we model the convection and interaction of cold, warm and energetic ions of plasmaspheric, plasmasheet, and ring current origins in the inner magnetosphere. We compare our simulation results with in-situ and remotely sensed measurements from recent instrumentation on Geotail, Cluster, THEMIS, and TWINS spacecraft.