Multi-Scale Modeling of Global of Magnetospheric Dynamics

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To understand the role of magnetic reconnection in global evolution of magnetosphere and to place spacecraft observations into global context it is essential to perform global simulations with physically motivated model of dissipation that is capable to reproduce reconnection rates predicted by kinetic models. In our efforts to bridge the gap between small scale kinetic modeling and global simulations we introduced an approach that allows to quantify the interaction between large-scale global magnetospheric dynamics and microphysical processes in diffusion regions near reconnection sites. We utilized the high resolution global MHD code BATSRUS and incorporate primary mechanism controlling the dissipation in the vicinity of reconnection sites in terms of kinetic corrections to induction and energy equations. One of the key elements of the multiscale modeling of magnetic reconnection is identification of reconnection sites and boundaries of surrounding diffusion regions where non-MHD corrections are required. Reconnection site search in the equatorial plane implemented in our previous studies is extended to cusp and magnetpause reconnection, as well as for magnetotail reconnection in realistic asymmetric configurations. The role of feedback between the non-ideal effects in diffusion regions and global magnetosphere structure and dynamics will be discussed.