Geophysical Research Abstracts
Vol. 14, EGU2012-8075, 2012
EGU General Assembly 2012

A new coupled model of the ionosphere-magnetosphere interhemispheric dynamics

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The ionosphere is known to play a key role in the electrodynamics of the magnetosphere, but the interhemispheric asymmetries and the connexions between the two hemispheres along the closed magnetic field lines introduce a new feature, the interhemispheric dynamics, which may have a significant contribution to the overall equilibrium. In order to access this dynamics, we have built a new interhemispheric model of the ionosphere, issued from the TRANSCAR family of ionospheric models (Blelly et al., 2005) and based on a 16-moment approximation. This new code has the ability to be used at all latitudes, and as it was the case for the previous generation, it accounts for the magnetosphere electrodynamics in transport of the ionospheric species along the field lines. However, the core of the new model is the dynamical and consistent coupling of the ionospheric transport to the magnetospheric transport through the development of an interface with the magnetosphere model IMM (Hurtaud et al. 2007), which accounts for the interhemispheric asymmetries in the ionospheric electrodynamics. The TRANSCAR-IMM retroactive coupled system is a pseudo 3D ionosphere-magnetosphere model, coupling a 1D approach along the magnetic field lines (TRANSCAR) and a 2D approach in the magnetic equatorial plane (IMM). It has been ported to a parallel architecture based on the Message Passing Interface (MPI) that allows for the simulation of large computational domains. The system is used to study the seasonal asymmetries between the northern and southern hemispheres, the resulting transport and energy transfer and the coupled effects between the ionosphere and the magnetosphere for many different latitudes and solar illumination conditions. We will present this new model and the initial results we obtain on the interhemispheric dynamics in condition of asymmetries between the two hemispheres.