STORMTIME MAGNETOSPHERE-IONOSPHERE INTERACTION IN GLOBAL SIMULATIONS

WILLIAM LOTKO, Peter Damiano, Oliver Brambles, Binzheng Zhang

Thayer School of Engineering, Dartmouth College, Hanover, NH 03755 USA

Long-duration, extreme forcing by the upstream driver induces qualitatively different states of the stormtime magnetosphere-ionosphere (MI) system relative to the more moderately driven system. We are using a multifluid version of the LFM global simulation model to examine this interaction, focusing, in particular, on the effects of electron precipitation and ionospheric outflows during such events. We know from observations that stormtime outflows add significant plasma to the magnetosphere with associated changes in mass composition. By comparing simulations with and without ionospheric outflow we show that this plasma addition has two contravening effects on the MI interaction. First, it enhances the ring current and inflates the magnetosphere. The inflation changes the shape of the dayside boundary, which tends to deflect the upstream flow so as to reduce the dayside reconnection potential and the polar cap potential. Second, by augmenting the plasma density of the magnetosphere and the plasmasheet, outflows also change the characteristics of auroral electron precipitation and the ionospheric conductance. We show that the resulting effect is to decrease the net field-aligned current (primarily region 1) flowing in the MI system. The closure of the region 1 currents in the magnetosheath, and the resulting JxB force there, are also affected, with the consequence that magnetosheath flow is accelerated away from the reconnection region more slowly relative to the case without outflow. This effect tends to enhance the dayside reconnection potential and the cross polar cap potential. The competition between these two effects is illustrated for stormtime simulations.

Magnetosphere-ionosphere interaction; storms; polar cap potential

William Lotko, Thayer School of Engineering, Dartmouth College, Hanover, NH 03755 USA,
Tel: 01-603-646-3485, Email: wlotko@dartmouth.edu