

Response of the Earth' s magnetosphere and ionosphere to the small-scale magnetic flux rope in solar wind by the MHD simulation

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We have studied the response of the Earth' s magnetosphere and ionosphere to two cases of small-scale magnetic flux ropes in solar wind by using a three-dimensional global MHD simulation. (1) the case of +Z axis of magnetic flux rope, the IMF is northward with a dawn to dusk B_y components as right-handed, (2) the case of +Y axis of magnetic flux rope, the IMF is north to southward with a duskward B_y as right-handed and solar wind dynamic pressure is normal (1.3 nPa).

The simulation results show that the bow shock is located at about $14.6 R_E$ and the magnetopause is located at about $10.24 R_E$ in both cases. However, ionospheric phenomena show the different feature for two cases. The cross polar cap potential becomes small during the northward even though magnitude of magnetic field becomes large for +Z axis of magnetic flux rope. And the cross polar cap potential increase that is governed by magnitude of magnetic field as well as southward B_z for +Y axis of magnetic flux rope.

Keywords: small-scale magnetic flux rope, magnetosphere and ionosphere , cross polar cap potential