THE EFFECT OF IONOSPHERIC PEDERSEN CONDUCTANCE ON THE FORMATION OF VORTICES IN THE MAGNETOTAIL

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In a series of simulation studies of the magnetosphere during prolonged intervals when the interplanetary magnetic field (IMF) was southward we found that earthward convection from a tail neutral line could stop and reverse direction forming large vortices in the tail. We have investigated the effects of ionospheric Pedersen conductance on magnetospheric convection by carrying out a series of simulations with steady southward IMF and fixed ionospheric conductance. For small conductances (3S and 6S) a “classical” convection pattern in which a near-Earth neutral line returns reconnected magnetic flux to the dayside occurs. However, for higher conductance (20S) like that found in the auroral zone during substorms flow in the near-Earth tail became stagnant and then vortices formed. We show that pressure gradients in the near-Earth plasma sheet alone are insufficient to cause the formation of the vortices and that a combination of ionospheric line tying and pressure gradients is needed.

Magnetospheric convection, vorticity, ionospheric conductance

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