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Effect of IMF on the trough location and relationship to plasma convection

M. Voiculescu (1), T Nygrén (2)

(1) Dept. of Physics, "Dunarea de Jos" University of Galati, Romania, (2) Dept of Physical Sciences, University of Oulu, Finland (Mirela.Voiculescu@ugal.ro / Fax 0040 236 461353 / Phone: 0040 236 460780

There is increasing evidence that the interplanetary magnetic field has important effects on ionospheric processes at auroral and polar latitudes. It has been shown that the occurrence of the F region trough is related to the orientation of the IMF. Both By and Bz components seem to play a role in the location and time of the trough occurrence. While a Bz dependence could be expected, due to its relationship with the geomagnetic activity, the explanation of trough occurrence with By is less clear. Since IMF governs the polar cap convection, we investigate here if this relationship can be explained by means of polar cap convection. For this purpose we use the poleward and equatorward edges of the trough which were determined from satellite tomographic observations. We have plotted their locations against modeled convection pattern based on IMF measurements coincident with trough observations given by the method of Papitashvili and Rich (2002). An interesting result is that the pattern of troughs observations rotate with the convection pattern when By changes its sign from positive to negative. This strongly supports the idea that indeed there is a strong relationship between troughs and convection. Another observation was that dayside troughs are observed more often when Bz is negative than in the opposite case, which suggests that fast convective flow favours the dayside trough occurrence. We conclude that plasma convection plays an important role in trough formation, which explains the effect of both y and z components on trough location.