

Fade of transpolar arc and its relation to the intensification of the nightside oval

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We have identified that night side oval intensification took place when the transpolar arc was fading. This is due to the switch of IMF Bz polarity from north to south. We have confirmed in the past that theta aurora appears in the polar cap region, corresponding to the IMF By polarity change (Type I) or long lasting strong IMF By (Type II) during northward IMF conditions. In the Type I case, the transpolar arc was detached from the morning (evening) side oval and moves dusk ward (dawn ward), corresponding to the IMF By polarity change from negative to positive (positive to negative). Movement of the transpolar arc is caused by the large supply of newly formed open field lines to the polar cap region, due to the change of the null point location. For the change of IMF By from negative to positive (positive to negative), accumulation of the magnetic flux occurs within the newly formed polar cap region in the dawn side (dusk side). When the IMF switched to the south, accumulation continues in the same side of the polar cap. Enhanced convection stores the energy and the stored energy at last releases, resulting in the intensification of the night side auroral oval. Location of the intensification with respect to the transpolar arc seems to depend on the IMF By polarity; i.e. dusk side for negative IMF By and dawn side for positive IMF By in the northern polar cap. For the Type II case, accumulation of open flux in the polar cap would enhance due to the switch of IMF Bz to the south, resulting in the intensification of the night side oval.

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