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The characteristics of theta aurora and implications for its production mechanisms

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Theta aurora can be described as an Trans Polar Arc which is parallel to the noon-midnight meridian. The arc can be attached to the aurora oval in both ends, the resulting optical feature shows obvious similarities to the Greek letter θ. The study we have made is based on several theta aurora events from 2001 through year 2004. The primary objective has been to characterize the theta aurora and implications for its production mechanisms. In order to complete this we have used data from the following satellites IMAGE, Polar, DMSP (F12, F13, F14 and F15), ACE, Wind and TIMED. Based on 10 observations of theta aurora we have found that the necessary precondition for theta aurora is an extended period of northward interplanetary magnetic field (IMF). In most cases theta aurora appears after an polarity change in the east-west component, By, of the interplanetary magnetic field. These two components of the IMF contributes to rearrange the reconnection location of the magnetic field lines and hence the ionospheric convection pattern. In the cases where sufficient data is available, theta auroras are located on the convection reversal boundary of the lobe convection cells. Studying both hemispheres provides extended information about theta aurora, which is found to be conjugate in some cases and non-conjugate in others. Investigating the particles associated with this auroral feature is further important to understand the overall picture of the related production mechanisms.