Daytime auroral precipitation during substorm development

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The database of DMSP F6 and F7 satellites for the 1986 was used for investigation of the pre noon (09-12 MLT) auroral precipitation during a substorm. We examined the dynamics of different auroral precipitation boundaries and simultaneous changes in average electron precipitation energy and energy flux in different precipitation regions during all substorm phases as well as the IMF and solar wind plasma conditions during a substorm. It was found that precipitation boundaries shifted to lower latitudes during the growth and expansive phase of substorm and then they are replaced to their pre substorm position in the substorm recovery. The enhancement of electron fluxes in all precipitation regions (SDP – soft diffuse precipitation, AOP - auroral oval precipitation and DAZ – diffuse auroral zone) began during the substorm growth phase. The most pronounced enhancement occurred in the SDP and AOP regions.

The enhancement of average precipitation energy in the SDP and DAZ regions during the growth phase of substorm observed simultaneously with the energy decrease in the AOP region. The sharpest decrease of energy occurred just before the substorm onset time [(T=T0-5 min) + 5 min] and it could correspond to the fading of dayside rayed auroral arcs.

The analysis of interplanetary medium parameters shows that substorms occurred predominantly during the southward IMF orientation suggesting that substorm development often was not associated with the northern turn or decrease of the southward interplanetary Bz. In northern (southern) hemisphere substorms on average occurred during the positive (negative) interplanetary By in winter, and they were observed generally when the interplanetary By was negative (positive) in summer.