Auroral electron precipitation during substorm

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Auroral particle observations from DMSP F6 and F7 spacecrafts were used to investigate the structure and dynamics of precipitating electrons in different auroral regions. The empirical model of electron precipitation during magnetospheric substorm was constructed. This model includes the dynamics of auroral precipitation boundaries with simultaneous changes in both the average electron energy and energy flux in different precipitation regions during all substorm phases. The global distribution of electron precipitation features was created on the average data in every 3-hour sector of the geomagnetic local time. It was shown that there is a gap constantly in dayside electron precipitation between the diffuse auroral zone, DAZ, and the region of auroral oval precipitation, AOP. The gap width depends on the substorm phase and is more pronounced in the 12-15 MLT sector. The equatorward displacement of different auroral precipitation boundaries in dayside sectors correlates well with the AL index variation. The exception is the DAZ equatorward boundary, which achieves the lowest latitude during the final stage of the substorm recovery phase. The average precipitation electron energy and the energy flux in prenoon (09-12 MLT) and afternoon (12-15 MLT) sectors are considered in details for comparison of their characteristics. It is shown that the average electron energy in the DAZ increases smoothly during the growth and expansive phases achieving the maximum level during the recovery phase of a substorm. Simultaneously the enhancement of the average energy fluxes in 09-12 MLT sector and decreasing in 12-15 MLT sector are observed in this region. The average electron energy in AOP and in higher latitude SDP regions changes insignificantly but the energy flux gets a maximum near the beginning of the substorm expansive phase.