

Subauroral Polarization Streams: Indication of Magnetosphere–Ionosphere Coupling

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Subauroral polarization streams, or SAPS, are narrow channels of strong westward ion flows in both the subauroral ionosphere and the conjugated inner magnetosphere in the nightside during geomagnetic storms and substorms. The SAPS are closely related with ionospheric conductivity and region-2 field-aligned currents. Many characteristics of SAPS have been determined from space-based measurements of electric fields and ion drifts in the ionosphere and the magnetosphere, and ground-based radar observations, such as the global occurrence based on the statistics of many individual event, long term variabilities, hemispheric asymmetries, electromagnetic wave structures, double peak signatures, and evolution patterns during intense storms and quiet time substorms. Multisatellite observations during a geomagnetic storm indicated that the SAPS were first initiated around the dusk sector and then expanded toward the midnight, moved to low latitudes and formed a wedge-shaped structure during the main phase. More recently, multisatellite observations during a severe storm revealed that strong oscillations occurred in the SAPS channel when IMF B_y changed from positive to negative. The SAPS oscillations were first observed in the pre-midnight sector and propagated towards the dusk sector. The oscillations may be related to the waves generated by the interaction between the fast-flowing energetic plasma sheet ions and the cold plasmasphere. The new features of SAPS provide new insights in to the coupling dynamics in the magnetosphere.

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