SAID-Related Nonlinear Wave Effects

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Abstract

We review recent observations of subauroral ion drifts (SAID) from the Cluster spacecraft that have shown that excitation of lower hybrid/fast magnetosonic plasma waves plays the fundamental role in SAID formation [1, 2]. The SAID features are explained in terms of a turbulent boundary layer formed over the plasmapause due to a short circuit of substorm-injected plasma jets (plasmoids). Nonlinear wave-particle interactions provide fast magnetic diffusion at the leading front and define the circuit's anomalous resistivity, similar to the well-documented plasmoid-magnetic barrier problem, including impulsive penetration at the magnetopause. As in a number of laboratory and active space experiments, mainly gradient-drift and current-driven instabilities define the hot-cold plasma overlap region near the outer boundary. Near the inner boundary and next to the SAID channel, anisotropic ion-driven processes dominate.

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References

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