

Alfven wave acceleration of particles in the aurora

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Above the polar auroras of the Earth, the magnetic field lines connecting the ionosphere to the night side of the magnetosphere support an electric current flowing along them. The acceleration of electrons at 1-10 keV energies that occurs in these regions of field aligned currents is the cause of the polar aurora displays, and an important factor of magnetic energy transfer from the solar wind to the Earth. Two main families of acceleration processes are observed: those based on coherent quasi-static structures called double layers, associated to direct currents, and those based on the propagation of Alfvén Waves, associated to time varying currents.

This paper is a review of Alfvénic acceleration processes. The most well known processes involve oblique wave vectors with perpendicular wavelentghs comparable to the ion Larmor radius (kinetic regime) or to the electron inertial length (inertial regime). But Alfvén waves with parallel wave vectors can also cause plasma acceleration by interacting with plasma cavities or with other Alfvén waves.

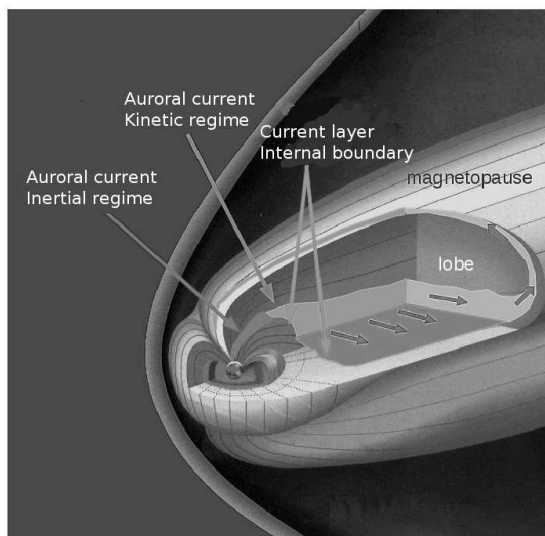


Figure 1: Schematic view of the magnetosphere. The nightside contains the lobes and the current layer. A part of the current of the current layer is diverted to the ionosphere across the auroral region.