

1D simulation of Electron acceleration by Inertial Alfvén wave pulse

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In order to investigate the influence of sharp increase of Alfvén speed in the top ionosphere on the auroral electron acceleration, a one-dimensional model is developed to simulate the electron acceleration by inertial Alfvén waves. The mirror force is included. The auroral electrons are treated as two components: cold that is described by the fluid equation and hot described by the Vlasov equation, both carrying field-aligned currents. Intense variation of Alfvén speed has been introduced by the inclusion of cold electrons. It is shown that when this Alfvén speed structure is considered, the efficiency of wave-particle interaction is enhanced. It is also demonstrated that the field-aligned current carried by these hot electrons which exceed the wave front is balanced by reverse current carried by cold electrons. During this process, much of wave energy has been transported into electron kinetic energy before the waves reach the ionosphere.

Key words: mirror force; electron acceleration; inertial Alfvén waves