

Cross-Field Ion Acceleration by Intermittent Kinetic Alfvén Waves in Space Plasmas

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Intense cross-field energization of the ions is often observed in the solar corona, solar wind and terrestrial magnetosphere. This energization has been mainly attributed to the ion-cyclotron damping or stochastic acceleration by high-frequency waves. We investigate the alternative possibility that this energization is due to low-frequency Alfvén waves that are short-wavelength across the magnetic field - kinetic Alfvén waves (KAWs). Short transversal wavelengths of the order of several proton gyroradii make KAWs accessible for the super-adiabatic acceleration of the ions in the vicinity of demagnetizing wave phases. The resulting ion energization is primarily across the background magnetic field. The main properties of this process are: (i) it is non-resonant, hence it does not need any wave coherence; (ii) it has a well-defined threshold character ; (iii) it can be efficient with rare super-critical waves; (iv) it can be reduced or enforced by the bulk field-aligned ion motion.