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Electron heating in coronal loops by Kinetic Alfvén Wave turbulence

Velocity and magnetic field fluctuations in coronal loops are excited by photospheric motions at various temporal scales. Several numerical models indicate that nonlinear interactions transfer fluctuating energy to small scales through a turbulent process, down to dissipative scales where plasma can be heated. Such a heating is probably due to kinetic effects, collisional dissipation being exceedingly small. In this work we consider a kinetic mechanism which energizes electrons by means of the longitudinal electric field associated with Kinetic Alfvén Waves, which are formed by the turbulent cascade at scales of the order of the proton Larmor radius. We describe a stochastic model for such phenomenon, where test particles are accelerated or slowed down by interactions with small-scale fluctuations. The results show that for realistic values of the large-scale velocity fluctuations the average power transferred to the electron population is of the order of that required to heat particles to a level compatible with the temperature of a coronal loop. We conclude that this mechanism is a good candidate to explain the energization of the plasma in a loop by fluctuations induced by photospheric motions.