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Generation of supra-thermal electrons in the quiet solar corona

C. Vocks and G. Mann

Astrophysikalisches Institut Potsdam, 14482 Potsdam, Germany (cvocks@aip.de)

Observations of solar wind electron velocity distribution functions (VDFs) show enhanced levels of supra-thermal electrons as compared to a Maxwellian VDF. In solar wind electron VDFs a thermal core can be identified as well as extended halo and superhalo components, ranging over several 10 keV. The phenomena of the solar activity, like flares and coronal mass ejections, are well known for accelerating electrons to high energies, but the suprathermal tails are observed also under quiet solar conditions. A coronal origin of these suprathermal electrons is well possible, since electrons with a few keV of kinetic energy are basically collision-free in the corona, due to the v^4 dependency of Coulomb collisional mean free paths on electron speed, v. The results of a kinetic model for the acceleration of electrons in the solar corona due to resonant interaction with whistler waves is presented. The model also includes the effects of Coulomb collisions and the inhomogeneous plasma background. The whistler waves enter the simulation box at the lower boundary with a given power law spectrum, and inside the box energy conservation between waves and electrons is guaranteed. Electron energies of up to 100 keV are covered by the model. The simulation results show the development of suprathermal tails of coronal electron VDFs, with power law coefficients that strongly decrease from the near-Maxwellian initial condition, until a final steady state of the simulation is reached. These results demonstrate that the quiet solar atmosphere is capable of producing enhanced fluxes of suprathermal electrons.