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Ion Scattering in the Solar Wind and Solar Corona: Particle-in-Cell Simulations SHINJI SAITO, S. PETER GARY, Los Alamos National Laboratory — Alfvén-cyclotron fluctuations at sufficiently short wavelengths and at propagation approximately parallel or antiparallel to a background magnetic field $\mathbf{B}_o$ in a relatively uniform, collisionless plasma can interact with protons and heavy ions. A cyclotron resonance between such fluctuations and the thermal velocity distribution of an ion species enables strong pitch-angle scattering, typically leading to an increase in the perpendicular (to $\mathbf{B}_o$) energies of that species. Particle-in-cell simulations in a magnetized, homogeneous, collisionless plasma of electrons, protons, and one very tenuous species of heavy ions are used to study the heavy ion response as a function of the initial magnetic power spectrum, the proton β, and the heavy-ion/proton relative speed. The goal of these simulations is to obtain better understanding of how Alfvén-cyclotron scattering may heat heavy ions in the solar corona. Magnetosonic-whistler fluctuations at $\mathbf{k} \times \mathbf{B}_o = 0$ and sufficiently high β_p can also scatter ions; however, this process typically leads to an increase in parallel ion energies. PIC simulations are also used to study proton scattering by such fluctuations; the results suggest that magnetosonic fluctuations may play a role in heating solar wind protons.

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