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Alfven-cyclotron scattering of solar wind ions: Hybrid simulations S. PETER GARY, LIN YIN, DAN WINSKE, 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. If alpha particles are a minority species, as in the solar wind, the proton and alpha resonance conditions are sensitive functions of the alpha/proton relative speed $v_{\alpha p}$ parallel or antiparallel to $\mathbf{B}_o$. This presentation describes hybrid simulations in which damped Alfvén-cyclotron fluctuations are imposed upon a homogeneous plasma bearing both protons and alpha particles. The results show the ion species responses to cyclotron resonant fluctuations as functions of several parameters, including the alpha/proton relative speed and the magnitude of the fluctuating magnetic field energy density. Simulation results are compared against spacecraft measurements in the solar wind near 1 AU to test the hypothesis that solar wind alphas display signatures of Alfvén-cyclotron scattering.

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