Abstract Submitted
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3D Simulations of Test Particle Propagation in the Fields of Whistler Waves.[1] KUSH MAHESHWARI, University of California, Berkeley, MARC SWISDAK, IREAP, University of Maryland-College Park, JAMES DRAKE, Dept. of Physics, University of Maryland-College Park — Whistler waves are oscillations in plasma thought to help inhibit energy transport in the solar wind and in galaxy clusters. Previous particle-in-cell (PIC) simulations studying the effect of whistler waves on astrophysical plasmas were restricted to 2D due to computational constraints. To study the full dimensionality of a whistler-mediated plasma, we build a test particle simulation using a Boris stepper algorithm, which preserves numerical accuracy of a particle's energy extremely well. The particles themselves do not generate their own electromagnetic fields or influence the wave. In a one-wave simulation, after verifying that canonical momentum is conserved in the dimensionally invariant direction, we find that kinetic energy is bounded and that particle trajectories are bounded in the plane perpendicular to the guide magnetic field. Adding a second wave not in the same plane as the first wave breaks dimensional invariance in the system, allowing the particles to diffuse arbitrarily far in the plane perpendicular to the guide field. These results suggest there is new physics to be discovered by examining the full dimensionality of plasmas involving whistlers, strengthening the case to perform a full 3D PIC simulation.

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