Abstract Submitted
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WICKED: A Computational Framework for the Evolution of Wave Turbulence in Inhomogeneous Plasmas[1] CHRIS CRABTREE, GURUDAS GANGULI, ALEX FLETCHER, STEVE RICHARDSON, United States Naval Research Laboratory — Kinetic effects can impact the evolution of global scale systems and yet often first-principles kinetic simulations are not feasible. Some canonical examples, include (1) the evolution of VLF waves in the radiation belts along with energetic electrons, and (2) the evolution of lower-hybrid turbulence by injection of heavy ions. Wave turbulence theory offers a reduced description of the evolution that may be more efficient. It consists of a diffusion equation describing the evolution of the action variables for resonant particles, i.e. a quasilinear equation, and a wave-kinetic equation that describes the transport of wave-energy along rays defined by a dispersion relation. The waves grow or damp due to linear interactions with the particles which through conservation of energy and momentum causes diffusion of particle action. The waves may also scatter due to nonlinear interactions. By treating both particles and waves as computational particles we develop a numerical solution to the coupled equations that we call Wave-in-Cell. We present ongoing efforts to develop a computational framework (WICKED: Wave-In-Cell for Kinetic Energetic Dynamics) to solve these equations in inhomogeneous plasmas and compare the results to PIC simulations.

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