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A New Model for the VLF Triggered Emission Instability

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We present a new model for the simulation of the nonlinear wave-particle interaction associated with the phenomenon of VLF triggered emissions. The model is physically identical to the Vlasov Hybrid Simulation, which has been previously used to model this phenomenon, but differs in the method used to track the evolution of the energetic electron distribution function and calculate the formation of resonant currents. As a result, the code presented here is better able to reproduce the exponential growth and saturation characteristics of the instability, but is less adept at producing the enduring, free-running plasma emissions that are also associated with the instability. Review of the modeling results indicates that the observed nonlinear growth is caused by wave amplitude gradients, and the associated detrapping of electrons from the wave potential well.