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Nonlinear Electron Response to Electromagnetic Fluctuations in the Zero Electron Mass Limit[1] F.L. HINTON, M.N. ROSENBLUTH, R.E. WALTZ, General Atomics — In gyrokinetic simulations of electromagnetic turbulence, the electron parallel motion sets a very small limit on the time step for stability - the electron Courant limit - when explicit finite difference schemes are used. Particularly troublesome is the nonlinearity arising from electron motion along perturbed magnetic field lines, when realistic ratios of electron and ion masses are used. We derive reduced equations for the limit of zero electron mass. These do not require solving the kinetic equation for passing electrons, whose contribution to the parallel current is given explicitly in terms of macroscopic quantitites which are the solutions of nonlinear differential equations. Since the electron mass does not appear, the electron Courant limit is removed.

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