Vlasov fluctuation theory and the Balescu-Guernsey-Lenard equation

Abstract: Since the mean-field limit for the Vlasov-Poisson equations is mathematically well-understood, at least for regularized potentials, it is desirable to have precise information about the evolution of fluctuations. However, after an initial result in 1977 by Braun and Hepp for fluctuations in the particles' trajectories, this part of the theory has been left in a somewhat unfinished state. After an overview of the field, this talk will present a new, fairly simple proof of the relevant central limit theorem and also some extensions/generalizations. As time allows, I will also outline some recent results that show how it may be possible to use the central limit theorem for Vlasov fluctuations as a starting point in order to derive the transport equations for a classical plasma (in particular, the Balescu-Lenard kinetic equation).