Generalised evolving background f_0 for plasma δf Particle-in-cell simulations

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The δf scheme aims to reduce the noise in the PIC method by *statistically* simulating only the evolution of a low variance function δf . The full distribution function is given by $f = f_0 + \delta f$, f_0 is referred to as the background. The importance of a good choice of the background has been demonstrated both theoretically [1][2] and practically [3]. However, it is clear that if f_0 is fixed and f evolves far from its initial value, δf is not going to remain a low variance function. Hence one seeks methods by which f_0 may be evolved in such a way as to keep the variance of δf small.

For collisional simulations Brunner *et.al.* [4] showed the practicality a scheme which evolved f_0 with fluid equations. When the system is not collision dominated such a fluid closure is not appropriate. However it is possible to maintain a representation of the background which is updated using statistical information from previous time steps.

We investigate the properties of such an evolving background scheme in the context of 2D Vlasov simulations.

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