Implementation of Landau-type collision operators in Eulerian-based Vlasov codes

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We will discuss progress toward implementing linearized and full nonlinear collision operators in Eulerian-based Vlasov codes applied for studying kinetic dynamics of wave propagation. Details of a discretization scheme using finite elements in velocity space and implicit in time will be presented. This approach enables numerical preservation of essential conservation and symmetry properties of the linearized collision operator. The optimal choice of velocity coordinates will also be discussed, considering that Cartesian, respectively spherical, coordinates are best suited for collisionless, resp. collisional, dynamics. As a first application, these collision operators have been implemented in the SAPRISTI code [S. Brunner and E. J. Valeo, Phys. Rev. Lett. **93**, 145003 (2004)] for studying phenomena related to laser plasma interaction. For this purpose, SAPRISTI has been extended to 1+2 phase space dimensions. First simulation results studying the effect of collisions on the dispersion and Landau damping of electron plasma waves will be shown.

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