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Relativistic Continuum Kinetic Algorithms, and a Path Towards a Novel Magnetised Kinetic Model for Relativistic Applications

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I will present our recent work on developing advanced discontinuous Galerkin algorithms for the special/general relativistic kinetic equations. These algorithms are based on directly discretizing the Vlasov equation as a PDE in phase-space, rather than using particles. I will show how one can carefully initialize initial equilibrium distribution functions and compute moments in a consistent manner. Recently we have developed a reduced 4D set of kinetic equations for making kinetic simulations of strongly magnetized plasmas more feasible. Though initially developed and implemented in the non-relativistic regime, the extensions to relativistic kinetics is straightforward, at least when the distribution function is separable, a situation commonly encountered in extreme astrophysical systems.

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