

A New Cross-Scale Simulation Model Connecting of MHD and PIC Methods

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A fluid description of plasmas is sufficient to investigate the global structure in space plasma, such as the magnetosphere and heliosphere. It follows the time evolution of macroscopic variations of density, bulk velocity and pressure. On the other hand, plasmas are precisely described by spatial and velocity distribution in the phase space. Wave-particle interaction process is the typical example for the application of the microscopic description. For these micro- and macroscopic description, different kinds of numerical approach are performed by MHD simulation for the macroscopic phenomena and PIC simulation for microscopic process. However, it is widely accepted that the cross-scale interaction between micro and macro processes works the crucial role in, for instance, the diffusion region in the magnetic reconnection process. Therefore, a new model which can treat MHD-scale dynamics including particle kinetic effects is necessary. We have developed the new simulation method. MHD and PIC simulations are simultaneously performed. Here we show its algorithm and some examples.