
High Performance Computing in plasma physics and magnetic fusion

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Résumé

Plasmas are a gas of charged particles obtained when heating a neutral gas to very high temperature so that the particles become ionised. They are used in many applications including some grand challenges like laser plasma accelerators or controlled thermonuclear fusion. To be understood, many plasma phenomena require kinetic models like the Vlasov equation, which are posed in a six dimensional phase space. The numerical simulation of these models is either based on a Particle-In-Cell (PIC) method or on a phase space grid. In both cases huge computational resources are necessary as well as very optimised algorithms. In this talk, after shortly introducing the physics, we will give an overview of the major numerical methods used for massively parallel simulations of the Vlasov equation and present some recent advances and remaining challenges.

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