CIDMA CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES
CENTER FOR R&D IN MATHEMATICS AND APPLICATIONS

universidade de aveiro

Gravitational Geometry and Dynamics Group Seminar

Wed., January 15, 2025, at 11h00.

Room: Sala Sousa Pinto and **Zoom ID:** 955 4130 8539

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Gent University

Kobra: a Vlasov Code with AMR

Plasmas in fusion reactors are highly prone to instabilities. Edge-localized modes (ELMs) occurring at the scrape-off layer (SOL) are instabilities that are responsible for large energy losses in the plasma core and present large potential for damage to the plasma-facing components. Since tokamak plasmas are a highly non-linear system, we require numerical methods to properly address their behavior. Classically, this has been done with MHD however the underlying fluid assumption is that the velocity distribution of the plasma particles is Maxwellian; this is not the case in the SOL and edge regions. This provides the motivation to move to a kinetic approach where the velocity distribution is left free and solved for directly. Particle-in-cell codes have been developed to address this however, they suffer from statistical noise in low density regions such as the SOL. We are developing a finite-volume, 3D-3V Vlasov-Maxwell code that will be able to accurately model edge plasmas free from statistical noise. Due to the six-dimensional phase space and the fine mesh required by finite-volume codes, direct tokamak simulations are computationally intractable. Therefore, we are also introducing an adaptive mesh refinement (AMR) scheme which provides significant computational speedup. This will allow a feasible path to simulate the onset and evolution of ELMs in a tokamak using a fully kinetic description.

More about Gr@v at: gravitation.web.ua.pt

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