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Capturing Coulomb Collisions

A Metriplectic Bracket Approach

Thursday, February 18th
18:00 Prague

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* PhD Candidate at AALTO University, Finland

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Title: Capturing Coulomb Collisions A Metriplectic Bracket Approach

Speaker: Riccardo Niccolo Iorio

When: 2021-02-18 18:00:00

Abstract: Since 1980s much effort has been devoted to the study of magnetized plasmas to better comprehend the mechanisms that undergo the confinement of particles and transport phenomena inside fusion devices. The complexity of the particles' trajectories in relation to the wide gap of time scales spanning from the electron cyclotron motion to the macroscopic phenomena that occur urged the development of perturbative time-scale reduction techniques to allow us to step over the computational limitations set by the gyromotion of particles. When dealing with the description of a plasma through the Vlasov-Maxwell-Landau system, both gyrokinetic and guiding-center theory are often applied to investigate solely the Vlasov-Maxwell part and the collision operator neglected or heavily approximated. In this talk it will be provided another indication of the possible existence of a metriplectic reduction theory which shades light to the development of a collision operator for electromagnetic reduced plasma theories. An energy and momentum conserving collisional bracket is constructed for the so-called guiding-center Vlasov-Maxwell model while discussing on why extensions to drift-kinetic and gyrokinetic electromagnetic theories are so difficult.

Email: fusionep-talks@egyplasma.com

Website: fusionep-talks.egyplasma.com