PICLS: a gyrokinetic full-f particle-in-cell code for open field line simulations

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While in recent years, gyrokinetic simulations have become the workhorse for theoretical turbulence and transport studies in the plasma core, their application to the edge and scrape-off layer (SOL) region presents significant challenges. The "full-f" code PICLS has been developed, to in particular study the SOL region with its steep density and temperature gradients as well as large fluctuation amplitudes. PICLS is based on an electrostatic full-f model with a linearized field equation and uses kinetic electrons. The electrostatic potential is calculated via the polarization equation, with the help of B-spline finite-elements for the charge deposition and the field solver. In this talk, we will introduce the PICLS model and show results of applying it to the well-studied 1D parallel transport problem during an edge-localized mode (ELM) in the SOL (Boesl *et al.* 2019*b*). For the collisional case (Boesl *et al.* 2019*a*), we show the implemented Lenard-Bernstein collision operator and its Langevin discretization, which was developed in the frame of MAGYK. In preparation for 3D simulations in slab geometry, the theoretical model for a 2D1D solver – with a FFT in the periodic dimension – will also be presented.

REFERENCES

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