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【213】Kinetic simulations of the magnetized plasma-wall boundary layer in fusion devices

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Considering conditions relevant to magnetic fusion plasmas, a code is being developed for solving in a kinetic framework the steady state solution of the plasma-wall boundary layer, comprising both the collisionless magnetic presheath and the Debye sheath.
For a given electrostatic potential profile, discretized on a finite element basis, the ion density in each element is calculated by summing the contributions of a set of particle trajectories whose initial conditions are sampled from a given incoming distribution function. An iterative scheme is used to correct the electrostatic potential profile until Poisson's equation is satisfied, thus bypassing a computationally expensive time evolution.
The code currently assumes a Boltzmann distribution of electrons, and generalization towards kinetic electrons is being developed.
Initially written in C+OpenMP [S. Zeegers, master thesis, Eindhoven Univ. of Tech.], the code is being rewritten in Chapel, a modern task and node-parallel programming language.

Author: VADOT, Nicole (EPFL)

Co-authors: ZEEGERS, S.; GERALDINI, Alessandro; BRUNNER, Stephan (CRPP-EPFL)

Presenter: VADOT, Nicole (EPFL)

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