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P2.1105 Introduction of kinetic effects to 1-D SOL/divertor plasma fluid simulation by collaborating with a particle model

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Development of SOL/divertor simulation codes is important to understand physics of edge plasma which determines huge heat fluxes to plasma-facing components, i.e., the bottleneck of fusion device designs. Fluid modeling is mainly used for SOL/divertor plasma simulations. However, there are a number of discrepancies between simulated and experimental results [1]. One of the causes is the kinetic effect, which is not fully considered in the present fluid modeling. Thus, kinetic codes, e.g., PARASOL [2], XGC1 [3] etc., have been developed for the edge plasma studies.

Within less computational cost compared with general PIC method, we have been introducing the kinetic effects into a 2-D fluid simulation by an add-on particle model. In this particle model at first, plasma parameters obtained from a fluid simulation, such as SONIC [4], are converted into initial velocity distributions of individual weighted-particles for electrons and ions. Next, particle trajectories and collisions are calculated for a short timescale without solving self-consistent electric field. Finally we obtain plasma parameters such as heat flux and viscosity, in which kinetic effects are correctly included.

In the present study, we developed a hybrid method for the fluid and particle models in a 1-D scale to establish the fundament of this hybrid concept. We started with a 1-D fluid simulation ranging from stagnation point to a divertor plate. As mentioned above, a timeslice of the fluid-simulation result is converted into a particle-simulation initial condition, and short-timescale particle simulation is carried out.

In order to verify the add-on particle model, we examine the influence of kinetic effects on the SOL/divertor plasma for a wide range of collisionality. We extend the preliminary addon model to the hybrid model where the particle-simulation result is now feedbacked to the fluid simulation.

[1] A.V. Chankin et al., J. Nucl. Mater. 390-391 (2009) 319
[2] T. Takizuka, Plasma Phys. Control. Fusion 59 (2017) 034008
[3] C.S. Chang et al., Phys. Plasmas 15 (2008) 062510
[4] H. Kawashima et al., Plasma Phys. Control. Fusion 49 (2007) 77

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