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**Kinetic analysis of collisionless plasma-wall transition layer**
GAKUSHI KAWAMURA, ATSUSHI FUKUYAMA, Dept. Nucl. Eng., Kyoto University — In the transport analysis of the fusion plasmas, the physics of the scrape-off layer is thought to be essential as a boundary condition. The modeling of PWTL (plasma-wall transition layer) is necessary to obtain the condition for the equilibrium state to exist for a given boundary condition. The PWTL requires the kinetic treatment because of the nonlinear behavior of plasma and the strong electric field. Therefore, we describe the densities of electron and ion as functions of the electrostatic potential using the Liouville's theorem and the energy conservation law. We assume collisionless plasma and particles are injected with the shifted Maxwellian. Combined with the Poisson equation, full-kinetic model equations which decide the potential profile are obtained and solved numerically. The solutions are classified as attached and detached states according to the conditions at the injection boundary. In the detached case, the length of the system can be arbitrary chosen and a long plateau is formed in the pre-sheath region, otherwise the maximum length is limited and only the Debye sheath is formed. The solutions are in good agreement with the results of particle simulations. We also investigate the magnetic pre-sheath by using guiding center descriptions.

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