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The Development of SOL Transport Model for Integrated Core-SOL Simulation of L-Mode Plasma

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Simulations of the plasma in the core and the scrape-off layer (SOL) region are carried out using 1.5D BALDUR integrated predictive modeling code to investigate tokamak plasmas in TFTR reactor operating in low confinement mode (L-mode). In each simulation, the plasma current, temperatures, and density profiles in both core and SOL regions are evolved self-consistency. The plasma profiles in the SOL region is simulated by integrating the fluid equations, including sources, along the field lines. The solutions in the SOL subsequently provide as the boundary conditions of the core plasma region. The core plasma transport model is described using a combination of anomalous transport by Multi-Mode-Model version 1995 (MMM95) and neoclassical transport provided by NCLASS module. Furthermore the calculation of the toroidal velocity used in this work is based on the torque due to intrinsic neoclassical toroidal viscosity (NTV). While the transport coefficients in the SOL region are either determined by fixed constants or neoclassical transport based on NCLASS calculation. By comparing with eight L-mode discharges from TFTR, it was found that the simulations using the transport based on neoclassical theory for SOL transport yields better agreement to experimental results for both density and temperature profiles.

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