

Abstract Submitted
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Recent Progress on the SOL power width scaling in BOUT plasma simulations¹ XUEQIAO XU, B. ZHU, LLNL, N. M. LI, X. X. HE, DLUT, X. Y. WANG, L. B. WANG, PKU, BOUT++ COLLABORATION — BOUT++ has been developed and applied for a range of problems that impact on boundary plasma fluctuation and resulting the SOL power width scaling. A summary of simulation progress and results will be presented including, but not limited to: (1) Simulating the DIII-D and EAST grassy ELM regime; (2) Analysis of edge turbulent transport and divertor heat load for ITER hybrid scenario; (3) Prediction of divertor heat flux width for ITER pre-fusion power operations; (4) Impact of plasma density/collisionality on divertor heat flux width; (5) Divertor power loads during thermal quench; (6) Deep learning surrogate model for kinetic Landau-fluid closure with collision. Simulation results show that the peak heat flux decreases while the corresponding width increases as the SOL fluctuation-driven transport increases due to larger turbulent fluxes ejected from the pedestal into the SOL when operating in either a small and grassy ELM regime, type-I ELMs or during thermal quench or in a high-density regime. In addition to the enhanced fluctuation-driven radial transport, the SOL power width can also be broadened due to the transition of the SOL residence time from the parallel particle flow time to the parallel conduction time in a high-density operation.

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