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Comparisons between tokamak fueling of gas puffing and supersonic molecular beam injection in 2D simulations[1] YULIN ZHOU, Sichuan University, ZHANHUI WANG, Southwestern Institute of Physics, XUEQIAO XU, Lawrence Livermore National Laboratory, HUIDONG LI, HAO FENG, Xihua University, WEIGUO SUN, Sichuan University — Plasma fueling with high efficiency and deep injection is very important to enable fusion power performance requirements. Two basic fueling methods, gas puffing (GP) and supersonic molecular beam injection (SMBI), are simulated and compared in realistic divertor geometry of the HL-2A tokamak with a newly developed module, named trans-neut, within the framework of BOUT++ boundary plasma turbulence code [Z. H. Wang et al., Nucl. Fusion 54, 043019 (2014)]. The physical model includes plasma density, heat and momentum transport equations along with neutral density, and momentum transport equations. Transport dynamics and profile evolutions of both plasma and neutrals are simulated and compared between GP and SMBI in both poloidal and radial directions, which are quite different from one and the other. It finds that the neutrals can penetrate about four centimeters inside the last closed (magnetic) flux surface during SMBI, while they are all deposited outside of the LCFS during GP. It is the radial convection and larger inflowing flux which lead to the deeper penetration depth of SMBI and higher fueling efficiency compared to GP.

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