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Divertor heat flux simulations in ELMy H-mode discharges of EAST and other tokamaks

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In this paper we report the simulations of the evolution of heat flux deposition and turbulence in edge plasma region for the ELMy H-mode discharges of EAST, C-Mod and DIII-D. The divertor sheath boundary conditions have been implemented into the BOUT++ six-field two-fluid model based on the Braginskii equations with non-ideal physics effects. This module has shown the comparable transient heat flux distributions towards divertor targets during ELM crashes on DIII-D. In order to perform consistent scrape-off-layer plasma transport calculations, the 2D fluid code SOLPS has been externally coupled to the 3D turbulence code BOUT++ for DIII-D and C-Mod. The radial profiles of turbulent transport coefficients have been calculated including the neoclassical transport and turbulent transport for the coupling. In order to study the effects of the different divertor materials of EAST on the transient heat fluxes in SOL induced by ELMs, the sheath energy transmission factors are calculated by full-PIC code PPSC within the secondary electron emission. The preliminary simulations show that if Te > 120eV, the energy transmission coefficients will show obvious differences between carbon and tungsten. The differences of ELM heat fluxes with carbon and tungsten divertors will be presented. The test particle module in BOUT++ framework will enhance the capability to understand the transport of the impurity and energetic particles during ELMs on EAST. The impurity particle loss under newly developed RF sheath induced equilibrium radial electric field will be reported in this paper.

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