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Simulation study on impact of pedestal height on energy loss process with resistive ballooning mode turbulence during pedestal collapse

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In future tokamak reactors such as ITER and DEMO, the intermittent heat flux released by edge localized modes (ELMs) should be avoided or mitigated to low level enough to remain within heat load constraints on plasma facing components. One of the critical issues is therefore to understand nonlinear dynamics underling ELMs and resultant energy loss process. For simulation studies on impact of fluctuation driven toroidally axisymmetric flows called convective cell modes (CCs) [1] on energy loss process during ELM crash, JOREK simulations reveal that strongly sheared CCs generated by the residual of force balance between $J \times B$ force and pressure gradient shear density filaments and suppress the energy loss level [2,3]. On the other hand, our numerical study on interplay between CCs and resistive ballooning mode (RBM) turbulence during pedestal collapse using BOUT++ code [4] shows that a secondary instability accompanied by a damped oscillation among pressure gradient, CCs and turbulence intensity rises and enhances energy loss level after the suppression of energy loss level by strongly sheared CCs [5]. This work is however limited to a nonlinear simulation with one parameter set and a further parameter scan varying resistivity, pedestal height and so on is required to get more generalized understanding on a role of CCs on energy loss process during pedestal collapse. In the present paper, we will report a sensitivity analysis on energy loss level during pedestal collapse in the presence of RBM turbulence against pedestal height using a series of shifted circular equilibria increasing plasma pressure.

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