HL-2A's Multiple ELM cycles simulations by integrating BOUT++'s drift MHD and transport codes

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Abastract:

There still exists serious shortage of integrating model about ELM cycle, in the aspects of 3D and nonlinear study. A new integrating model has been developed to couple tokamak edge multi-scale magnetohydrodynamic (MHD) events and transport simulations, such as edge localized-mode (ELM) cycles. As a proof of principle, we first start from a set of three field two-fluid model equations which includes the pressure, current, and vorticity. The equations are separated into the slowly evolving part of the axisymmetric component by taking a time average of the axisymmetric component. The time-averaged fluxes, which are quadratic in fluctuating quantities, act as driven terms for the time-averaged axisymmetric quantities that determine the plasma transport, and therefore the large scale evolution of the plasma profiles. Then the HL-2A's ELM cycle is simulated with utilizing the model. The ELM crash and pedestal recovery are obtained under the condition of fueling and auxiliary heating. Good agreements of ELM size and pedestal recovery time have been achieved for the solutions obtained from the coupled simulation compared to experiment.

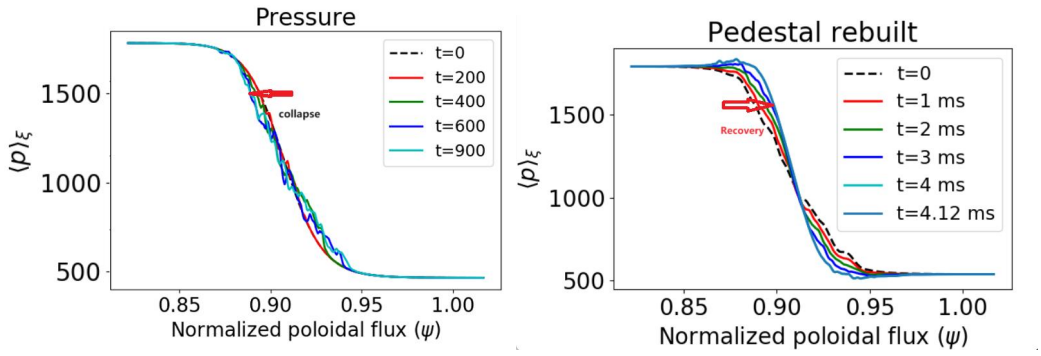

Figure 1: Simulation of HL-2A's pedestal collapse and recovery