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ITR/P1-17: Integrated Modelling of ITER Hybrid Scenarios Including Momentum Transport, NTMs, and ELMs in Preparation for Active Control

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Hybrid scenario is an operational regime designed to achieve a long pulse operation with a combination of inductive and non-inductive current drive. It was suggested for the operation of ITER to allow high fusion power in long pulse operations over 1000 s at a plasma current lower than the inductive reference scenario. Engineering tests of reactor-relevant components, such as breeding blankets are planned to perform in this scenario .
Here, we report integrated simulation results of ITER hybrid scenario including momentum transport, neoclassical tearing mode (NTM), and edge localised mode (ELM). In this work, ASTRA is used for integrated simulations of plasma equilibrium, transport, heating and current drive, and magnetic island evolution, self-consistently. Firstly, the effect of toroidal rotation to confinement is addressed by solving the momentum transport equation including inward pinch, turbulent transport and residual stress. Secondly, the ELM activities are simulated and the pedestal height of ITER hybrid scenario is predicted. Lastly, the NTM activities are simulated and the capability of the ECH upper launcher is evaluated. The methodology of simulations presented can be applied to design feedback controllers for ELMs and NTMs in ITER.

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