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P1.1055 Utilizing M3D-C1 to understand triggering of ELMs in pellet pacing experiments in DIII-D ITER-like plasmas

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M3D-C1, a code for solving the linear and non-linear extended-MHD equations in toroidal geometry, is currently being used to model pellet ELM triggering in DIII-D ITER-like plasmas. Large edge localized modes (ELMs) in magnetically confined plasmas can lead to the sudden release of thermal and magnetic stored energy and can potentially cause damage to plasma facing components, especially as stored energy increases in larger devices. ELM pacing via injection of hydrogenic pellets can trigger small ELMs at a rate exceeding the natural ELM frequency and has been shown to be a successful method to mitigate effects of large ELMs. Understanding of the physical mechanisms of ELM triggering and improved modeling are required for confident extrapolation to ITER and beyond. A feature of M3D-C1 is that an unstructured triangular mesh provides sufficient resolution to capture the sharp gradients present in the pellet deposition layer. Additionally, the code provides high toroidal resolution that is important for investigating the ballooning mode physics of ELM triggering by pellets. M3D-C1 results run in 2D linear mode show that the localized perturbation is due to the pellet destabilizing peeling-ballooning modes. Calculations of linear peeling-ballooning stability as a function of pellet size suggest that a 2D pellet density ring underestimates the effects of the pellet. Linear simulations also suggest that the destabilization seems to be a resistive effect. Recent M3D-C1 modeling efforts have focused on 3D nonlinear, timedependent simulations incorporating a pellet ablation model. Simulations are focused on pellets injected at a speed of 150 m/s and are focused on studying how the pellet size and ablation location affect ELM triggering in DIII-D ITER-like plasmas. Initial 3D results show toroidally localized perturbations in the pressure and current profiles due to the presence of the pellet.

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