An understanding of H-mode pedestal instabilities in the DIII-D tokamak

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Abstract. The experimental and modeling results on H-mode edge localized mode (ELM) instabilities from the DIII-D tokamak project are reviewed. This work has led to the conclusion that the most common type of ELM, called Type I, is triggered by a coupled peeling-ballooning instability driven by the pressure gradient and current density in the H-mode edge pedestal region. Good agreement is found between theoretically predicted stability boundaries and toroidal mode numbers for this instability and experimental observations of edge pedestal parameters and ELM amplitude and frequency as a function of discharge shape and edge-region collisionality. The range of toroidal mode numbers for which there is access to a second stability regime is shown to play an important role. This model of H-mode edge stability has been used to predict the pedestal parameters for ITER and FIRE.

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