Physics of slow L-H transitions in the DIII-D tokamak

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Abstract. Details of the low-high (L-H) confinement transition are studied by a new technique which allows for an arbitrarily slow transition between the L- and H-modes on DIII-D. During the transition, the plasma is in an intermediate state (IM-mode) of temperature, density, confinement, and edge shear flow. The IM-mode is characterized by periodic bursts of an edge instability, governed by predator-prey type relaxation oscillations, which evolve into type III edge localized modes (ELMs) as the neutral beam heating power is raised. An ELM-free H-mode is achieved when the edge pressure gradient is large enough to support shear flow sufficient to quell the IM-mode edge instability.