# ABSTRACT

Measurements in the DIII–D tokamak [J.L. Luxon *et al., Plasma Physics and Controlled Fusion Research*, 1986 (International Atomic Energy Agency, Vienna, 1987), Vol. I, p. 159] show that edge gradients of ion and electron temperature and pressure, $\nabla T_i$, $\nabla T_e$, $\nabla P_i$ and $\nabla P_e$, are good candidates for parameters which link the heating power to the fundamental physics of the spontaneous Low-mode (L–mode) to High–mode (H–mode) transition. These gradients are measured in the region where the H–mode transport barrier forms and they are found to consistently increase in time during the L-phase of discharges which make a transition to H–mode. Moreover, for a fixed magnetic configuration, there is a well-defined boundary between the L–mode and H–mode states in the $\nabla T_e - \nabla P_e$ operational space diagram. However, the gradients are considered catalysts of the transition in the sense that they are drivers for a more fundamental control parameter. The values of $T_i$, $T_e$, $P_i$ and $P_e$, measured at this location, show smaller relative changes during the L-phase of these transitions, indicating that the scale lengths of these quantities are decreasing as the L-H transition is approached in time. These results are consistent with several theoretical models in which gradients of pressure or temperature are catalysts of the transition.