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Generalization of the Heuristic Drift SOL Model for Finite Collisionality, and Effect on Flow Shearing Rate vs. Interchange Growth Rate[1] ROBERT GOLDSTON, Princeton Plasma Physics Laboratory, ANDREW BROWN, Princeton University — We generalize the Heuristic Drift (HD) model of the scrape-off layer width, taking into account both the enhanced SOL confinement time at high collisionality and the increase in upstream temperature at very low collisionality. We find that there is a wide range of upstream separatix density over which the original HD model is applicable, but at high collisionality the SOL widens, in agreement with experimental data from ASDEX-Upgrade and JET. We further find that for typical low-gas-puff H-mode conditions, the projected *ExB* flow shearing rate in the SOL dominates over the interchange growth rate, while for typical L-Mode conditions, and at the high densities where H-Modes return to L-Mode, the interchange growth rate dominates. The result may be related to that of Halpern and Ricci (2017) with respect to the steep gradient region of the SOL in inner-wall-limiter discharges. Taking $\omega_s > \gamma_{int}$ as the criterion for the H-Mode, we can use the generalized HD model to predict the scaling of the H→L Mode transition. We find a stronger scaling of power with density, approximately squared, than the conventional L→H Mode threshold. The values for existing machines, and for ITER, are somewhat below the L→H Mode predictions, consistent with significant hysteresis, especially at lower densities.

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Robert Goldston
Princeton Plasma Physics Laboratory

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