Isotopic effect on L-H transition in flux driven non linear fluid simulations.

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H-mode operation is the scenario envisaged for future burning plasma, but significant uncertainties remain to understand the parametric dependencies of the power threshold. Some have been widely explored as the dependence on the magnetic field intensity, or the isotopic effect, where the power threshold is found to be higher in H than in D [1].

The latter is studied in flux driven non-linear fluid simulations with EMEDGE3D [2]. In EMEDGE3D, L to H transition features has been reproduced using three-dimensional first-principles plasma edge turbulence electrostatic simulations. A spontaneous transport barrier has been observed to form spontaneously above a threshold of the input power, the key element relying on the coupling between the equilibrium pressure gradient and the poloïdal flow through both radial force balance and neoclassical friction [3].

EMEDGE3D neoclassical friction has been improved from a fit between known values of the neoclassical coefficients, to a more complete calculation [4]. It has also been extended from electrostatic to electromagnetic fluid equations. It is shown that with this new set of equations, above a certain power threshold a pressure pedestal is forming as in [CHONE14]. The diamagnetic effects are presently being included in the model in order to model both Resistive Ballooning Modes and Drift Waves modes. With this updated version of the code, the threshold for pedestal formation obtained for a D plasma will be compared to the one obtained for a H plasma.

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