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Collective Edge Modes and Advanced Confinement Regimes[1]
TIANCHUN ZHOU, BRUNO COPPI, MIT — A unified theory has been developed for the modes excited at the plasma edge that are signatures of the advanced confinement regimes (the EDA/ELMy H-Regimes and the I-Regime). The modes identified theoretically have traits that are consistent with or have anticipated those of the modes observed experimentally for these regimes. The QCM in the EDA H-Regime is identified as a ballooning mode [1] near FLR marginal stability involving ion transverse viscosity and other dissipative effects. In the EDA Regime impurities are driven outward as the combined effects of their temperature gradients and thermal conductivity, while in the ELMy H-Regime impurities are driven toward the core. In the I-Regime the "Heavy Particle" mode [2] has a phase velocity in the v_{de} direction and expels the impurities toward the plasma edge. The modes for the ELMy H-Regime are also of the ballooning kind and close to conditions under which the growth rates are proportional to half power of the relevant dissipation parameters involving finite magnetic diffusivity and electron thermal conductivity and can have phase velocities in either directions.

[1] B. Coppi & T. Zhou, submitted to PoP.
[2] B. Coppi & T. Zhou, PoP 19, 012302(2012); Phys. Lett. A 375, 2916(2011).

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