Comparison of energetic particle radial transport between single-*n* and multiple-*n* simulations of Alfvénic modes

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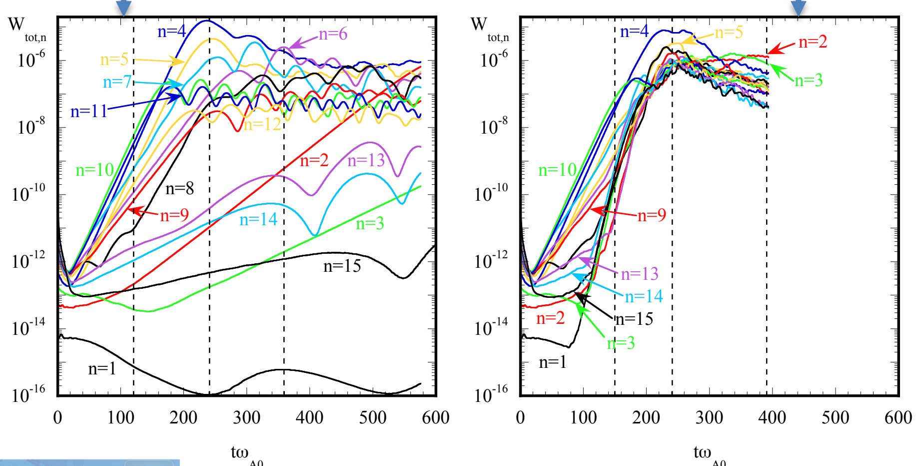
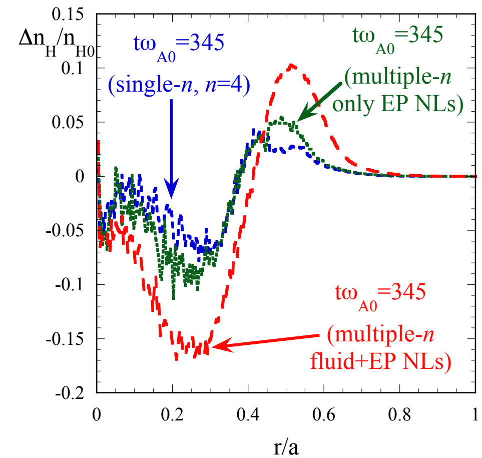
- Comparison between single-*n* and multiple-*n* simulations of Alfvénic modes has been performed, using the HMGC code; simulations with the toroidal mode numbers $1 \leq n \leq 15$ have been considered.
- In single-*n* simulations, the equilibrium considered (circular cross section, low inverse aspect ratio, $\varepsilon_0=0.1$), in presence of a Maxwellian Energetic Particle (EP) population, results as either stable (n=1), weakly unstable (n=2, 3 and n=13, 14, 15) or unstable ($4 \leq n \leq 12$), with n=4, 5, 10 exhibiting the larger growth-rates; a variety of modes are observed (TAEs, upper and lower KTAEs, EPMs). Weak or negligible EPs radial transport is observed at saturation, for all the toroidal mode numbers considered.
- In multiple-*n* simulation, NL mode-mode coupling from MHD terms and mediated by EP term (three wave coupling), strongly drives sub-dominant modes already during the linear growth phase of the dominant modes; radial profiles of e.m. fields (ψ, ϕ) and real frequencies are substantially different from linearly unstable, single-*n* modes; all the toroidal modes saturate almost simultaneously, inducing enhanced EP transport (w.r.t. the single-*n* simulations). No evidence of "domino" effects is observed in multiple-*n* simulation.

Single-*n* simulations vs. multiple-*n* simulation:

$$W_{tot;\,n} = W_{kin;\,n} + W_{mag;\,n}$$



EP radial density profile variation at saturation



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