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P5.1066 A heuristic Dimits shift prediction using reduced tertiary instability analysis

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An intriguing phenomenon, likely to be of relevance in future fusion devices operating at or near beyond the threshold of marginal ITG-stability, is the Dimits upshift, where close above the linear threshold stabilising zonal flow shear nearly complete suppress these modes. The general features of this phenomenon are broadly understood, but a quantitative predictions of, among other things, the size of the upshift is lacking. Recently however, St-Onge presented a simple but efficient heuristic prediction that yielded good results for a simple modified Terry-Horton system.
As an intermediary step on the path to extending this prediction to full gyrokinetics, an analytically tractable strongly driven, local gyrokinetic limit with both linear drive and nonlinear zonal-drift wave interactions is presented. After supplying additional damping to artificially push the system to the Dimits regime, St-Onge's method can be slightly modified to produce a Dimits shift prediction which continues to impress when compared with results from fully nonlinear simulations. The consistency and robustness of the prediction across a wide selection of parameter choices and damping operators indicates that it may continue to be applicable even in full gyrokinetics, something ongoing Z-pinch studies intend to investigate.

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