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Improved Convergence for the LoDestro Method at Marginal Stability[1] ALEX FRIEDMAN, LYNDA L. LODESTRO, JEFFREY B. PARKER, Lawrence Livermore National Laboratory — We present recent progress on a method for multiple-timescale coupling of global gyrokinetic simulations with a transport solver, to evolve a self-consistent temperature profile $T(x)$. This requires implicit advancement of the transport difference equation for T over an interval Δt. The original LoDestro method [1] has been successfully employed with GENE microturbulence simulations via the Tango solver [2]. However, near marginal stability of the underlying turbulence model, the dependence of the turbulence-generated flux on ∇T becomes extremely stiff; in such cases, Tango-GENE studies confirm that strong under-relaxation of the iteration employed is needed, resulting in slow convergence. We have formulated and tested a revised, more robust iteration that (on a model problem) overcomes this difficulty and promises major savings in computational effort. The new technique and our results to date are presented. [1] A. Shestakov, L. L. LoDestro, et al., J. Comp. Phys. 185, 399 (2003). [2] J. B. Parker, L. L. LoDestro, D. Told, G. Merlo, L. F. Ricketson, A. Campos, F. Jenko and J. A. F. Hittinger, Nucl. Fusion 58, 054004 (2018).

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