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Exploration of turbulent optimization in toroidal configurations[1]

H. MYNICK, N. POMPHREY, PPPL, P. XANTHOPOULOS, Max Planck Institut fur Plasmaphysik — We continue exploration of the potential for reducing the levels of turbulent transport in stellarators and tokamaks, making use of the STELLOPT optimization code and the GENE gyrokinetic code. The original applications of the method focused on ion temperature gradient transport in a quasi-axisymmetric stellarator design.[2] The method has now been applied to both other starting configurations, including tokamaks and other stellarator classes, and to other turbulence channels.[3] This growing body of results is finding that the effectiveness of the current proxy measure Q_{prox} used by STELLOPT to estimate transport levels differs depending on the class of toroidal device considered. Also, the dependence of Q_{prox} on the radial curvature captures well what GENE simulations find[2], but its dependence on local shear needs refinement for this very important "knob" to also be used in the turbulent optimization. We are using these results to discern the different physics features causing this, and thereby to improve Q_{prox}.

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[2]H.E. Mynick, N. Pomphrey, P. Xanthopoulos, Phys. Rev. Letters, 105, 095004 (2010).
[3]H.E. Mynick, N. Pomphrey, P. Xanthopoulos, Phys. Plasmas, 18, 056101 (2011).

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