Abstract Submitted
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Improved Numerical Methods for the Plasma Transport Problem[1] G.W. HAMMETT, J.L. PETERSON, PPPL, J. CANDY, General Atomics — Direct calculation of the evolution of a magnetic fusion plasma due to small scale turbulence is very challenging because of the wide range of time and space scales. TGYRO [1] and TRINITY [2] solve this problem by a multiscale expansion, using implicit methods to couple the long-time transport equations to gyrokinetic turbulence calculations. TGYRO solves the steady-state problem using a Newton solver to iterate to a global solution. However, with a complex residual terrain, this problem is difficult for a traditional Newton algorithm. Using intuition gained by a simple test problem, we develop improved algorithms that improve the efficiency and reliability of the root-finder. These include a Levenberg-Marquardt algorithm and line backtracking. As a test, we compare these methods on discharges from DIII-D and NSTX using the TGLF transport model [3]. Finally, we predict results for an upcoming experiment on NSTX and explore how impurities can improve electron confinement.

[1] J. Candy et al., Phys. Plasmas 16, 060704 (2009)
[2] M. Barnes et al., Phys. Plasmas 17, 056109 (2010)
[3] G. M. Staebler and J. E. Kinsey, Phys. Plasmas 17, 122309 (2010)

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Greg Hammett
Princeton Plasma Physics Laboratory

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