# Tokamak profile prediction using direct gyrokinetic and neoclassical simulation

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Tokamak transport modeling scenarios, including ITER performance predictions, are based exclusively on reduced models for core thermal and particle transport. The reason for this is simple: computational cost. A typical modeling scenario may require the evaluation of thousands of individual tranport fluxes (local transport models calculate the energy and particle fluxes across a specified flux surface given fixed profiles). Despite the progress over the last decade in advancing the state-of-the art in direct gyrokinetic simulation, the cost of an individual gyrokinetic simulation remains so high that direct gyrokinetic transport calculations have been avoided. By developing a steady-state iteration scheme suitable for direct gyrokinetic and neoclassical simulations, we have been able to obtain steady-state transport solutions for DIII-D plasmas. The new code, TGYRO, encapsulates the GYRO code, for turbulent transport, and the NEO code, for kinetic neoclassical transport. Results for DIII-D L-mode discharge 128913 are given, with computational and experimental results showing consistency in the region $0 \leq r/a \leq 0.8$.

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