Abstract Submitted
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Big Data Validation of the TGLF Transport Model[1] TOM NEISER, General Atomics/ ORAU, ORSO MENEGHINI, STERLING SMITH, General Atomics, MICHELE FASCIANA, Politecnico di Torino, GARY STAEBLER, JEFF CANDY, General Atomics — Accurately calculating the heat flux in fusion plasmas is computationally prohibitive using first-principles gyrokinetic codes. The trapped gyro-Landau-fluid (TGLF) code addresses this problem by solving a reduced set of gyrokinetic equations. To accurately model the nonlinear saturation of turbulence, the TGLF code employs so-called saturation rules SAT0 or SAT1. To validate the TGLF model, we built a database containing 2500 plasma discharges in the DIII-D tokamak, for which we have generated a corresponding database of 1.8×10^5 time and space slices. The data was filtered to eliminate unphysical cases with negative energy fluxes and MHD unstable cases. Moreover, we have eliminated cases close to the thresholds of kinetic ballooning modes and drift wave turbulence. The two saturation models SAT0 and SAT1 were subsequently validated with the filtered dataset of 10^5 cases. Lastly, to help in the validation efforts we applied machine learning tools to the filtered dataset. As a consistency check for our neural network, we find that we are able to accurately reproduce the free parameters of the saturation rules SAT0 and SAT1, which have previously been calibrated by GYRO. These tools will help identify any promising areas for improvement of these saturation rules.

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