Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Validation of TGLF in C-Mod and DIII-D using machine learning and integrated modeling tools[1] P RODRIGUEZ-FERNANDEZ, AE WHITE, NM CAO, AJ CREELY, MJ GREENWALD, MIT, BA GRIERSON, PPPL, NT HOWARD, MIT, O MENEGHINI, CC PETTY, GA, JE RICE, F SCIORTINO, MIT, X YUAN, PPPL — Predictive models for steady-state and perturbative transport are necessary to support burning plasma operations. A combination of machine learning algorithms and integrated modeling tools is used to validate TGLF in C-Mod and DIII-D. First, a new code suite, VITALS, is used to compare SAT1 and SAT0 models in C-Mod. VITALS exploits machine learning and optimization algorithms for the validation of transport codes. Unlike SAT0, the SAT1 saturation rule contains a model to capture cross-scale turbulence coupling. Results show that SAT1 agrees better with experiments, further confirming that multi-scale effects are needed to model heat transport in C-Mod L-modes. VITALS will next be used to analyze past data from DIII-D: L-mode “Shortfall” plasma and ECH swing experiments. A second code suite, PRIMA, allows for integrated modeling of the plasma response to Laser Blow-Off cold pulses. Preliminary results show that SAT1 qualitatively reproduces the propagation of cold pulses after LBO injections and SAT0 does not, indicating that cross-scale coupling effects play a role in the plasma response. PRIMA will be used to “predict-first” cold pulse experiments using the new LBO system at DIII-D, and analyze existing ECH heat pulse data.

[1]Work supported by DE-FC02-99ER54512, DE-FC02-04ER54698

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MIT

Date submitted: 13 Jul 2017 Electronic form version 1.4