Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Neoclassical Toroidal Viscosity Torque Profile Prediction Via Deep Learning[1] MITCHELL CLEMENT, NIKOLAS LOGAN, MARK BOYER, PPPL — Using neoclassical toroidal viscosity (NTV) torque, at the plasma edge, can be vital in optimizing pedestal performance by controlling the rotation profile and/or alignment of the radial electric field zero-crossing with a rational surface to facilitate RMP ELM suppression. The offset rotation provided by NTV to spin the core could help provide tearing stability in various scenarios. The Generalized Perturbed Equilibrium Code (GPEC) package can be used to calculate the plasma stability and NTV torque profile generated by 3D magnetic fields. These calculations, however, involve complex integrations over space and energy distributions, which takes time to compute. GPECnet is a densely connected neural network that has been trained on GPEC data, to predict NTV torque and the least stable plasma δW in real-time. Initially, GPECnet has been trained solely on data representative of the wide pedestal quiescent H-mode scenario, in which neutral beams are often balanced and toroidal rotation is low across the plasma profile. This work provides the foundation for active control of the rotation shear using a combination of beams and 3D fields for robust and high performance QH mode operation.

[1]Work supported by US DOE contracts DE-AC02-09CH11466 and DE-FC02-04ER54698.

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Date submitted: 26 Jun 2020 Electronic form version 1.4