Testing Paleoclassical Predictions against Measured DIII-D Pedestal Profiles*

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The accurate prediction of kinetic profiles (densities and temperatures) in the pedestal is important in predicting the performance of future burning plasma experiments. A predictive model of the electron and ion temperature profiles and the electron density profiles is given in the report UW-CPTC 10-6, by including the paleoclassical mechanism as the main cause of electron transport in the pedestal. In this presentation, the predictions of this model are compared to a database of measured DIII-D pedestal profiles to provide an initial quantitative test of the validity of the paleoclassical model in the pedestal.

The analytic predictions can be improved upon by using numeric models to evaluate the neoclassical and turbulent transport processes. One key component of the paleoclassical based predictions is that the top of the pedestal is determined by where turbulent transport mechanisms become dominant over paleoclassical mechanisms. The TGLF model [1] can provide more accurate turbulent diffusion than the approximations given in the aforementioned report. Initial attempts to use the TGLF model with the paleoclassical model in the predictive transport solver GCNMP [2] will be reported.

[1]   G.M. Staebler, J.E. Kinsey and R.E. Waltz, Phys. Plasmas **14**, 055909 (2007)
[2]   H.E. St. John, "The GCNMP Module Summary," presented at the US-Japan Workshop on Integrated Simulation of Fusion Plasmas, Oak Ridge, Tennessee, 2007; http://cswim.org/meetings/us-japan-2007/st-john.pdf