Predicting Core and Edge Transport Barriers in Tokamaks Using the GLF23 Drift–Wave Transport Model

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Abstract

The density and temperature profiles are predicted in core and edge transport barriers in the DIII-D tokamak [J. L. Luxon and L. G. Davis, Fusion Tech. **8**, 441 (1985)] using the GLF23 drift wave model. The GLF23 model has been retuned to yield a better fit to the linear gyrokinetic growth rates for reversed magnetic shear and H–mode pedestal parameters. The turbulent saturation levels are determined using nonlinear gyrokinetic simulations. Using a large profile database, we find that the retuned and original GLF23 models yield comparable results for discharges with monotonic safety factor profiles and no discernable internal transport barriers (ITBs). We provide examples of using retuned GLF23 model to predict the temperature profiles in simulations of several DIII-D strongly reversed magnetic shear ITB discharges. Particle transport simulations show that the model is successful in predicting the density profile in discharges without ITBs but that some additional background particle diffusivity is needed in order to reproduce the measured density profiles within the barrier region of ITB plasmas where the ion temperature gradient (ITG) and trapped electron mode (TEM) transport has been quenched by rotational shear stabilization.

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