# Stochastic Tranport Modeling for DIII-D*

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Fully three-dimensional computations of heat transport for resonant perturbation edge localized mode (ELM) suppression experiments [1] on low-collisionality DIII-D H-mode plasmas have been carried out by coupling the TRIP3D field line tracing code to the three-dimensional E3D [2] two-fluid transport code. These transport calculations have been benchmarked against the axisymmetric UEDGE [3] code in order to quantify the effect of stochasticity on DIII-D plasma profiles. TRIP3D includes both the axisymmetric equilibrium fields and the vacuum fields produced by DIII-D intrinsic field errors, error-correction coils, and MHD control coils. E3D then computes the change to the electron and ion temperature profiles caused by 3D magnetic field geometry. The E3D code uses Monte-Carlo integration to solve the advection-diffusion equation for temperature by tracking the Brownian motion of heat packets. It efficiently treats the highly anisotropic heat conductivity (strong parallel transport) by working in multiple local magnetic coordinate systems that follow the three-dimensional field line motion.

The magnetic field model shows that, in the absence of strong plasma response, the perturbations would produce a stochastic layer and a splitting of the separatrix over the outer 5%-10% of flux surfaces. This allows a large fraction of field lines to directly escape which produces significant cooling of the pedestal and a non-axisymmetric temperature distribution in the vicinity of the X-point. Similar structures are seen in filtered tangential TV images of CIII emission near the X-point. IR-TV and Langmuir probe data show non-axisymmetric changes to the divertor heat load pattern that will be compared to simulation results. However, Thomson scattering data indicate that the pedestal temperature remains high and that it is the density that is significantly reduced. To fully understand the role of n=3 perturbations in ELM suppression on DIII-D and predict its performance on ITER, better understanding of the plasma response to the applied vacuum field perturbations is necessary. Improvements require self-consistent modeling of the induced non-axisymmetric plasma currents and electric potential.

[1] T.E. Evans, *et al.*, Nucl. Fusion **45** (2005) 595.
[2] A.M. Runov, *et al.*, Phys. Plasmas **8** (2001) 916.
[3] T. Rognlien, *et al.*, J. Nucl. Mater. **196-198** (1992) 347.

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