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Effects of Plasma Shaping on Nonlinear Gyrokinetic Turbulence
E. A. BELLI, G. W. HAMMETT, PPPL, W. DORLAND, U. Maryland — The effects of flux surface shape on the gyrokinetic stability and transport of tokamak plasmas have been studied using the GS2 code. Studies of the scaling of nonlinear turbulence with shaping parameters have been performed starting with a representative JET-like flux surface and artificially varying elongation, triangularity and their radial gradients together using the Miller analytic equilibrium formalism[1] to approach the circular limit via linear interpolation. Both linearly and nonlinearly, high shaping was found to be a stabilizing influence on the ITG turbulence, and a scaling of the heat flux with elongation of $\chi \sim \kappa^{-1.5}$ or κ^{-2} (depending on the triangularity) was observed. While this is not as strong as empirical elongation scalings, it was also found that high shaping results in a larger Dimits upshift of the nonlinear critical gradient due to enhanced zonal flows. The effects of electromagnetic dynamics coupled with shaping are also presented. For electromagnetic runs, beta is varied with shaping to keep the Troyon-normalized beta fixed while also holding q_{95} fixed. These results indicate that beta strongly affects the electron transport, particularly for more circular plasmas, and may lead to unsaturated transport in some cases, even well below the linear ballooning limit.

[1]R. Miller, et al, Phys. Plasmas **5**, 973 (1998).

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