Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Modeling Error-Field Response of the Resistive Wall Mode[1] DOV RHODES, A.J. COLE, G.A. NAVRATIL, J. BIALEK, A.H. BOOZER, Columbia University, R. FITZPATRICK, University of Texas at Austin, J.P. LEVESQUE, M.E. MAUEL, Q. PENG, Columbia University — Stability of the resistive wall mode (RWM) is sensitive to error-fields as small as 10^{-4} [1]. Error-fields introduced by slight coil misalignments can induce localized resonant torques generated by shielding currents in a resistive plasma, as well as a global non-resonant torque created by symmetry-breaking deformations of the magnetic surfaces. The latter effect, termed neoclassical toroidal viscosity (NTV), is of particular interest as tokamak plasmas become hotter and less collisional. Both torques contribute to rotation damping which tends to non-linearly destabilize the RWM. Fitzpatrick's 2010 [1] quasi-linear sharp-boundary model of the multi-mode plasma response includes the non-ideal effect of resonant torques. We present an extended model including NTV to study the effect of error-field driven torques and plasma shaping on the evolution of the RWM. The model will be formulated to provide input for Bialek's VALEN code [2], which calculates RWM stability in the presence of a realistic conducting wall geometry. A better understanding of the plasma response to error-fields will facilitate more effective design of feedback control systems in a tokamak.

[1] R. Fitzpatrick, Phys. Plasmas 17, 112502 (2010).
[2] J. Bialek, Phys. Plasmas 8, 2170 (2001).

[1]Supported by U.S. DOE Grant DE-FG02-86ER53222.

Dov Rhodes
Columbia University

Date submitted: 09 Jul 2014 Electronic form version 1.4