Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Axisymmetric curvature-driven instability in a model toroidal geometry[1] W.A. FARMER, D.D. RYUTOV, Lawrence Livermore National Lab

— A model problem is presented which qualitatively describes a pressure-driven instability which can occur in the divertor region of a tokamak where the poloidal field becomes small. The model problem is described by a horizontal slot with a vertical magnetic field which plays the role of the poloidal field. Line-tying boundary conditions are applied at the planes defining the slot. A toroidal field lying parallel to the planes is assumed to be very strong, thereby constraining the possible structure of the perturbations. Axisymmetric perturbations which leave the toroidal field unperturbed are analyzed. Ideal magnetohydrodynamics is used, and the instability threshold is determined by the energy principle. Because of the boundary conditions, the Euler equation is, in general, non-separable except at marginal stability. This problem may be useful in understanding the source of heat transport into the private flux region in a snowflake divertor which possesses a large region of small poloidal field, and for code benchmarking as it yields simple analytic results in an interesting geometry.

[1]This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

William Farmer
Lawrence Livermore National Lab

Date submitted: 11 Jul 2013 Electronic form version 1.4