

Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Complex Behavior of a Fluid Jet within Rotating Annular Flow

BRENDAN MCGEEHAN, MICHAEL BURIN, HANTAO JI, WEI LIU, Princeton Plasma Physics Laboratory — 2-D simulations of fluid flow between co-rotating cylinders have been performed where the velocities of the inner and outer cylinders are set so that the flow is stable to centrifugal instabilities. For small aspect ratios, the flow is significantly altered by viscous boundary effects that cause a large imbalance between the centrifugal force and pressure gradient near the vertical boundaries. As a result, a secondary circulation appears. This circulation produces a jet flowing radially outward at the mid-plane of the system. Above a critical Reynolds number, this jet is observed to exhibit a regular flapping motion. As the Reynolds number is further increased, the flapping motion becomes more complex. This oscillation is globally reflected in the torque required to rotate the cylinders. We have analyzed time-series of the torque and stream function of the fluid at various Reynolds numbers to look for signatures of a transition to chaos.

Brendan McGeehan
Princeton University

Date submitted: 20 Jul 2006

Electronic form version 1.4