Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Pattern Dynamics in Taylor Vortex Flow with Double Hourglass Geometry[1] RICHARD WIENER, NICHOLAS CARROLL, MATTHEW MCCORD, Physics Dept., Pacific University, THOMAS OLSEN, Physics Dept., Lewis & Clark College — In previous investigations [2] we have demonstrated experimentally that Taylor vortex flow in an hourglass geometry undergoes a period-doubling cascade to chaotic pattern dynamics that can be controlled by proportional feedback with small perturbations. The hourglass geometry creates a spatial ramp in the Reynolds number. This results in a region of supercritical vortex flow between regions of subcritical structureless flow that provide the pattern with soft boundaries that allow for persistent dynamics. For a range of reduced Reynolds numbers, the Taylor vortex pattern exhibits persistent dynamics consisting of drifting and stretching vortices punctuated with phase slips. Each phase slip corresponds to the generation of a new vortex pair. We are currently investigating the phase dynamics of Tayor vortex flow with a double hourglass geometry which consists of two regions of supercritical flow in which phase slips occur, separated by a narrow region of subcritical flow. Initial results indicate that at some reduced Reynolds numbers there is synchronization between the vortex dynamics in the two regions, both in the temporal occurrence of the phase slips as well as the drift directions of the vortices.

[1]Research supported by NSF DMR-0241814 and 0241890
[2]Wiener *et al.*, Phys. Rev. E **55**, 5489 (1997) & Phys. Rev. Lett. **83**, 2340 (1999)

Richard Wienerr
Pacific University

Date submitted: 08 Aug 2005 Electronic form version 1.4