Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Perturbation response of model vortex rings and dipoles CLARA O'FARRELL, JOHN O. DABIRI, California Institute of Technology — Jetting swimmers, such as squid or jellyfish, propel themselves by forming axisymmetric vortex rings. It is known that vortex rings cannot grow indefinitely, but rather "pinch off" once they reach their physical limit, and that a decrease in efficiency of fluid transport is associated with pinch-off. In contrast, two-dimensional vortex dipoles have been found to grow well beyond the physical limit observed in axisymmetric vortex rings. Previously, the Norbury and Pierrehumbert families of vortices have been used as models for axisymmetric vortex rings and two-dimensional dipoles respectively, and the response of these two families to shape perturbations has been characterized. In this study, we improve upon the Norbury and Pierrehumbert models, using nested contours to obtain more realistic models for experimentally-generated vortex rings and dipoles. The resulting vortices are subjected to shape perturbations akin to those previously introduced to members of the Norbury and Pierrehumbert families, and their response is characterized.

Clara O'Farrell
California Institute of Technology

Date submitted: 10 Aug 2012 Electronic form version 1.4