Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

The reconfiguration of broad leaves in strong winds and currents
LAURA MILLER, University of North Carolina at Chapel Hill, ALEX HOOVER, Tulane University, JEREMY MARZUOLA, University of North Carolina at Chapel Hill — Flexible plants, fungi, and sessile animals are thought to reconfigure in the wind and water to reduce the drag forces that act upon them. In strong winds, for example, leaves roll up into cone shapes that reduce flutter and drag when compared to paper cut-outs with similar shape and flexibility. Simple mathematical models of a flexible beam immersed in a two-dimensional flow will also exhibit this behavior. What is less understood is how the mechanical properties of a two-dimensional leaf in a three-dimensional flow will passively allow roll up and reduce drag and flutter. In this project, we use computational fluid dynamics and particle image velocimetry to determine how leaves roll up into drag reducing shapes in extreme conditions. Force and flow measurements are taken on real broad leaves and simplified physical models. Corresponding numerical simulations using the immersed boundary method are used to understand which features of the flexible leaves result in proper reconfiguration and drag reduction.

Laura Miller
University of North Carolina at Chapel Hill

Date submitted: 31 Jul 2015 Electronic form version 1.4