Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Drag on Flexible, Slender Bodies Streamlined in Turbulent Flow
JEFFREY ROMINGER, HEIDI NEPF, Department of Civil & Environmental Engineering, Massachusetts Institute of Technology — Dynamic reconfiguration in response to turbulent fluid forcing alters the instantaneous drag forces on flexible, slender bodies, such a submerged aquatic plants. In this study we experimentally investigate the role of plant morphology, specifically length and structural stiffness, in reducing instantaneous drag forces on flexible plastic strips streamlined in turbulent flow. We limit this investigation to the stable regime of fluid- solid interactions, which is typical of many species of submerged aquatic vegetation. First the structural stiffness of the flexible strips is varied to determine how bending in response to turbulent fluid forces can alter instantaneous drag forces. We also investigate the role played by the ratio of the turbulence lengthscale to the length of the plastic strips. When the turbulence lengthscale is similar to or larger than the strip length, turbulent forces can act coherently over the length of the strip, which may enhance instantaneous forces. In contrast, when the turbulence lengthscale is smaller than the strip, the instantaneous forces can be non-coherent and interfere destructively, reducing the effect of the instantaneous forces on the strip.

Jeffrey Rominger
Department of Civil & Environmental Engineering,
Massachusetts Institute of Technology

Date submitted: 09 Aug 2011 Electronic form version 1.4