Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Clap and fling in tiny insects with porous wings ARVIND SANTHANAKRISHNAN, LAURA MILLER, UNC Chapel Hill, ALICE ROBINSON, California Institute of Technology, TYSON HEDRICK, UNC Chapel Hill — In contrast to the flapping flight of insects of length scales ranging from the fruit fly to the hawk moth, the aerodynamics of flight in insects such as thrips that are 1 mm or less in length is not as well understood. Viscous effects become significant at this range of flight where Reynolds number Re < 10, and lift forces drop significantly relative to drag forces. These insects have been proposed to augment lift through adaptations in the flight kinematics, wing flexibility and wing morphology. With reference to the flight kinematics, thrips and other tiny insects clap their wings at the end of each upstroke and fling them apart at the beginning of each downstroke (see Ellington, J. Exp. Biol., 1980). Furthermore, these insects have highly bristled wing surfaces as opposed to solid wings. We explore the role of bristled wings on the flapping flight of thrips using 2D numerical fluid-structure interaction simulations. The input parameters for the simulations are obtained from high-speed video recordings of actual insects. An idealized form of the 'clap and fling' motion of two wings immersed in fluid is considered herein, and the bristles on the wings are modeled as a homogeneous porous layer using the immersed boundary method. The effect of having bristles on the flow field is examined and compared to that of an equivalent solid wing.

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Date submitted: 06 Aug 2010 Electronic form version 1.4