Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Sorting Category: 08.14.2 (C)

On small insect flight – a two-dimensional study PAULO FERREIRA DE SOUSA, New Mexico State University — Small insect flight is characterized by very small Reynolds numbers and relatively simple wing motions. In this study, a two-dimensional approximation of small insect flight is calculated with a newly developed high-order immersed boundary incompressible Navier-Stokes flow solver. The simulated motion of the model wing is a simplification of the flight of Drosophila melanogaster, and was done in line with previous experimental and numerical simulations available in the literature. Calculations were carried out until a time-periodic steady-state was achieved. Changes in lift generation and vortex dynamics are studied for Reynolds numbers spanning two orders of magnitude, in order to accurately find the critical Re number above which flapping flight is possible. Above the critical Reynolds number, vortices are alternately shed during translation. Below the critical Reynolds number, vortices are formed but not shed during translation, creating two attached and almost identical vortices. This transition is significant because, below it, an important mechanism of lift generation no longer applies, effectively indicating a lower bound for insect flight to occur.

Paulo Ferreira de Sousa
psousa@nmsu.edu
New Mexico State University

[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 30 Nov 2005 Electronic form version 1.4