Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Numerical study of tandem flapping wings hovering near ground
SRINIDHI N G, VENGADESAN S, Indian Inst of Tech-Madras — The ground effect on tandem elliptical foils hovering in an inclined stroke plane is studied using immersed boundary projection method. The computations are carried out at a low Reynolds number, $Re = 100$, in a quiescent fluid at different heights from the ground. The effect of phase relationship, ψ, between the fore- and hindwings on force variation is studied. Flow induced by the rebound vortices changes the effective angle of attack (AoA) of the wings and influences the force generation. In some cases, the shed vortices merge with the rebound vortices and create a sustained recirculating vortex which has a significant effect on the force generation of the forewing. In counter-stroking ($\psi = 180^o$) and in-phase stroking ($\psi = 0^o$), the rebound vortices increase the effective AoA of the forewing and increase the lift coefficients; interestingly, for $\psi = 90^o$, such an increase in forces is not observed. Except for the cases with $\psi = 90^o$, time-averaged vertical force coefficient of the forewing is always greater than the hindwing. For selected cases, backward in time finite-time Lyapunov exponent (FTLE) ridges are used in conjunction with vorticity contours to gain more insight into the vorticity dynamics.

Srinidhi N G
Indian Inst of Tech-Madras

Date submitted: 28 Jul 2016 Electronic form version 1.4