Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Bio-inspired flows in unsteady environments. Part II: crosswind gusts MEILIN YU, NARESH POUDEL, University of Maryland, Baltimore County, JOHN HRYNUK, U.S. Army Research Laboratory — Autonomous underwater vehicles (AUVs) and unmanned aerial vehicles (UAVs) usually need to carry out tasks in unstructured and dynamic flow environments. This poses a number of challenges that cannot easily be addressed by approaches developed for highly controlled environments, such as uniform flows frequently used in experiments and numerical simulation This work studies the impact of crosswind gusts on the performance of flapping wings/fins at moderate to high Reynolds numbers (i.e., in the range from 10e+4 to 10e+6). A high-order accurate flux reconstruction flow solver with moving/deforming body-fitted unstructured meshes is used to perform the numerical simulation. We find that dynamic stall in a crosswind gust is very different from the stalled flow at a large geometric angle of attack (AoA) due to the different transient dynamics of the leading and trailing edge vortices. Reynolds numbers can significantly affect the vortex structures over the suction surface of the foil The effects of relative position between the gust and foil and gust strength are also discussed in this study.

Meilin Yu
University of Maryland, Baltimore County

Date submitted: 02 Aug 2019 Electronic form version 1.4