

Abstract Submitted
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Tip vortex characteristics of a hovering multirotor propeller¹

YOUNG-JIN YOON, HAECHON CHOI, Seoul National University — We investigate the tip vortex characteristics of a hovering multirotor propeller using large eddy simulation. Flow field and aerodynamic coefficients from the current simulation show good agreements with those from experiments. We identify instantaneous locations of tip vortices and explore wandering motions at different vortex ages. The magnitude of the wandering motion increases with vortex age and this results in an overall increase of turbulence level along the slipstream boundary. To identify the velocity statistics around the tip vortex and the growth rate of the vortex core, the vortex center is identified during evolution of each tip vortex and surrounding velocity fields are ensemble-averaged. The swirl velocity exhibits a self-similar behavior when normalized with the peak velocity and core radius, and the velocity profile is well described by the Lamb-Oseen model. The vortex core shows a lower growth rate than that from large scale rotors. The distributions of the Reynolds stresses reveal strong anisotropy with the highest level of turbulent kinetic energy located inside the core.

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