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The trajectory of a leading-edge vortex following separation from an oscillating hydrofoil YUNXING SU, QUENTIN GUILLAUMIN, KENNETH BREUER, Brown University — Oscillating hydrofoils operating at high angles of attack shed leading edge vortices (LEVs) into the wake during their flapping cycle. Predicting the path that these vortices follow is of critical importance when attempting to optimize the interactions between multiple foils operating in close proximity. Here, we report on Particle image velocimetry (PIV) measurements of the flow field generated by an oscillating hydrofoil at various pitch amplitude and reduced frequency. Using the Q-criterion (Haller 2005), the LEV location was identified and tracked both on the hydrofoil and in the wake. We find that a larger pitch amplitude generally resulted in an earlier LEV shedding from the foil together with the generation of a wider wake behind the foil; higher reduced frequency usually delayed the LEV shedding from the foil leading to a narrower wake. The effects of endplates were also explored. Here we find that that with endplates on the foil the LEV appeared more coherent and stayed closer to the foil. Once shed into the wake, the LEV shed with endplates generally travelled at the same cross-stream (Y) position, while the LEV shed without endplates continued to travel away from the centerline, resulting in a wider wake.

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