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Vortex Trajectory of High Pitch-High Heave Oscillating Hydrofoils BERNARDO LUIZ ROCHA RIBEIRO, JENNIFER FRANCK, University of Wisconsin, Madison — Oscillating pitching and heaving foils have been shown to be an efficient mechanism for harvesting hydrokinetic energy. Due to the high pitch and heave amplitudes required for energy production, oscillating foils produce a wake of coherent vortices that interact with downstream foils in array configurations. In order to better predict the vortex-foil interactions, the formation and trajectory of the primary leading edge vortex (LEV) is explored computationally. The hydrofoil kinematics are varied with reduced frequencies of $fc/U_\infty = 0.1$ and 0.15, with heave amplitudes of $0.5 - 2c$ and pitch amplitudes of $65° - 85°$. The downstream position and timing of the LEV is relatively independent of Reynolds number, but it is strongly influenced by the kinematics. Differences in flapping frequency produce two different LEV trajectory patterns due to changes in the LEV structure during the heave stroke. At the higher frequency the LEV remains attached longer and thus has a lower convective speed in the wake. As the pitch amplitude is increased the LEV size and its trajectory's vertical distance increase linearly, however as the heave amplitude is increased the maximum vertical distance traveled by the LEV saturates non-linearly.

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