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Flow Structures and Energy Capture from an Oscillating Hydrofoil JENNIFER FRANCK, SARAH FRANK, SHREYAS MANDRE, Brown University — The flow surrounding an oscillating hydrofoil in a uniform freestream is computationally investigated for hydrokinetic energy capture. Simulations are performed on an elliptical hydrofoil using 2D Direct Numerical Simulation (DNS) for low Reynolds number and 3D Large-Eddy Simulations (LES) for high Reynolds number simulations at 80,000. A non-inertial reference frame is utilized for rigid-body motion of the hydrofoil, which is prescribed a sinusoidal motion in pitch and heave. The kinematic parameters are varied and the resulting flow features are correlated with positive or negative energy capture. In an effort to optimize the stroke, variations in the sinusoidal heave and pitch signals are systematically explored and analyzed for future closed-loop control.

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