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Parametric dependence of energy harvesting performance with an oscillating hydrofoil[1] BENJAMIN STROM, DAEGYOUM KIM, SHREYAS MANDRE, KENNETH BREUER, Brown University — We report on experiments on tidal energy conversion from a open channel water flow using an oscillating hydrofoil. The hydrofoil is operated at high angles of attack such that the formation and capture of a leading edge vortex greatly enhances the energy conversion efficiency. A computer-controlled pitch and heave system allows for arbitrary position profiles to be imposed. Force and torque measurements are used to determine the energy harvesting efficiency as a function of Reynolds number, pitch and heave amplitudes, phase shift, the location of the pitching axis, position profile, and the cross sectional shape of the hydrofoil. PIV measurements are used to capture the vortex dynamics and these results are compared to the computational results of Frank and Franck (2013). Efficiency was found to be most sensitive to pitch amplitude, pitching axis and phase shift with relatively little dependence on Reynolds number, heave amplitude, and foil shape.

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