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The effect of aspect ratio on the performance of an energy harvesting hydrofoil[1] DAEGYOUM KIM, BENJAMIN STROM, YUNXING SU, SHREYAS MANDRE, KENNETH BREUER, Brown University — We investigated the effect of aspect ratio on energy harvesting performance and flow structure of an oscillating hydrofoil. Power measurement and particle image velocimetry were performed in a water flume with a hydrofoil undergoing periodic heaving and pitching motions. Aspect ratio was varied from 2.5 to 4.5, and end plates were also mounted at the hydrofoil tips in order to suppress three-dimensional effects near the tips. For each aspect ratio, energy conversion efficiency was maximum at the same kinematics determined by reduced frequency and pitch amplitude. The efficiency is increased with the aspect ratio, and it is noticeably enhanced with the installation of the end plates. Leading-edge vortex formation and wake dynamics were compared at several spanwise sections among different aspect ratios. Their correlation with the efficiency was also examined.

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Daegyoum Kim
Brown University

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