Abstract Submitted
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A novel immersed boundary method applied to the inverted flag problem[1] ANDRES GOZA, TIMOTHY COLONIUS, Caltech — This work uses a 2-D immersed boundary method to study the inverted flag problem, in which a deformable flag is pinned at the trailing edge with its leading edge free to flap. Compared with the canonical flag problem, the inverted configuration more readily undergoes large flapping behavior for a wide range of mass ratios, making it promising in the field of flow-energy harvesting. A previous study identified several flapping modes as a function of dimensionless mass and stiffness ratios (Kim, D. et. al, J. Fluid Mech, 2013). The present work investigates the role of vortex formation and wake-flag interaction on the different flapping regimes. Simulations are performed using a 2-D immersed boundary method that accurately computes surface stresses imposed on the body by the fluid boundary conditions. Unlike many immersed boundary methods that reconstruct surface stresses from the velocity field, the current method only uses information from the immersed surface, leading to a smaller algebraic system for the fluid-solid coupling. The large flapping behavior of the inverted flag problem highlights the method's ability to simulate flows around bodies undergoing large deformations.

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