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Axial flow effects on robustness of vortical structures about actively deflected wings in flapping flight[1] ALBERT MEDINA, University of California, Los Angeles, JIHOON KWEON, HAECHEON CHOI, Seoul National University, JEFF D. ELDREDGE, University of California, Los Angeles — Flapping wing flight has garnered much attention in the past decade driven by our desire to understand capabilities observed in nature and to develop agile small-scale aerial vehicles. Nature has demonstrated the breadth of maneuverability achievable by flapping wing flight. However, despite recent advances the role of wing flexibility remains poorly understood. In an effort to develop a deeper understanding of wing deflection effects and to explore novel approaches to increasing leading-edge vortex robustness, this three-dimensional computational study explores the aerodynamics of low aspect ratio plates, in hovering kinematics, with isolated flexion lines undergoing prescribed deflection. Major flexion lines, recognized as the primary avenue for deflection in biological fliers, are isolated here in two distinct configurations, resulting in deflection about the wing root and the wing tip, respectively. Of interest is the interaction between axial flow along the span and the vortical structures about the wing. It is proposed that the modes of deflection explored may provide a means of axial flow control for favorably promoting LEV robustness over a broad range of flapping conditions, and provide insight into the nature of flexibility in flapping wing flight.

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