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A computational study of the clap-and-fling aerodynamic mechanism[1] MARCOS VANELLA, University of Maryland, GRIGORIOS PANAGAKOS, Denmark Technological University, ELIAS BALARAS, University of Maryland — Clap-and-fling is a particular wing kinematic pattern utilized by some insects and birds to produce enhanced aerodynamic forces. It consists of two very distinct phases: i) the leading edges of the two wings are brought together near the upper limit of the upstroke and subsequently the wings are rotated around their leading edges, "clapping" like a closing book; ii) at the onset of the downstroke, and while they are still close, the two wings rotate around their trailing edges "flinging" apart. Prior theoretical and experimental work suggested that clap-and-fling is responsible for production of unusually high lift coefficients. However, due to limitations of the theoretical models and experimental techniques, detailed quantitative results are yet to be reported. In the present work we provide a concrete description of the underlying physics by means of high-fidelity three-dimensional simulations based on the Navier- Stokes equations for incompressible flow. Our results verify the lift enhancement trends observed in the experiments and indentify the particular flow patterns correlated with such increases.

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