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Flexible clap and peel in the smallest insects LAURA MILLER, University of Arizona, MICHAEL SENTER, University of North Carolina at Chapel Hill, SHANON JONES, North Carolina State University, ALEX HOOVER, University of Akron — Of the insects that have been filmed in flight, those that are 1 mm in length or less often clap their wings together at the end of each upstroke and fling or peel them apart at the beginning of each downstroke. This motion both enhances the lift forces generated during flight and also dramatically increases the drag required to fling the wings apart. Since the horizontal component of the forces acting on each wing at the end of the upstroke and beginning of the downstroke nearly cancel, the horizontal force does not contribute to thrust, lowering the aerodynamic efficiency of flight. In this presentation, a 3D parallelized and adaptive implementation of the immersed boundary method is used to numerically simulate clap and peel in rigid and flexible wings. We find that the drag forces generated during peel in 3D are substantially lower than those generated in 2D due to the strong flow normal to the root-to-tip axis. Drag is further reduced when flexibility is incorporated. In some instances, the net lift forces generated are also improved relative to the rigid wing case.

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