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Sea Butterfly Swimming: Time-resolved Tomographic PIV measurements DAVID MURPHY, Civil and Environmental Engineering, Georgia Tech, LINGXIAO ZHENG, RAJAT MITTAL, Mechanical Engineering, Johns Hopkins University, DONALD WEBSTER, Civil and Environmental Engineering, JEANNETTE YEN, Biology, Georgia Tech — The planktonic sea butterfly *Limacina helicina* swims by flapping its flexible, wing-like parapodia. The appendage stroke kinematics of this shell-bearing pteropod are three-dimensional and likely contain elements of both drag-based (rowing) and lift-based (flapping) propulsion. Unsteady lift-generating mechanisms such as clap-and-fling may also be present. Upstroke and downstroke motions both propel the animal upward and roll it forwards and backwards, resulting in a sawtooth trajectory. We present time-resolved, tomographic PIV measurements of flow generated by free-swimming pteropods (*Limacina helicina*) moving upwards with average swimming speeds of 5 – 17 mm/s. The pteropods beat their appendages with a stroke frequency of 4 – 5 Hz. With a size range of 1 – 2 mm, the animals filmed in this study operate in a viscous environment with a Reynolds number of 5 to 20. The volumetric flow measurements provide insight into the three dimensional nature of the flow and into the relative importance of drag- and lift-based propulsion at this low Reynolds number. Preliminary results from Navier-Stokes simulations of the flow associated with the swimming of this organism will also be presented.

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