Abstract Submitted
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The role of body stiffness in wake production for anguilliform swimmers[1] ERIC TYTELL, Johns Hopkins University, MEGAN LEFTWICH, Los Alamos National Laboratory, CHIA-YU HSU, Feng Chia University, AVES COHEN, University of Maryland, College Park, LISA FAUCI, Tulane University, ALEXANDER SMITS, Princeton University — We compare wake structures shed by the undulatory motion of physical and computational models of an anguilliform swimmer, the lamprey. The physical model is a robotic lamprey-like swimmer with an actively flexing tail, and with passively flexible tails of different stiffnesses. The computational model is a two-dimensional computational fluid dynamic (CFD) model that captures fluid-structure interaction using the immersed boundary framework. The CFD model included both actively flexing and passively flexible tail regions. Both models produced wakes with two or more same-sign vortices shed each time the tail changed direction (a "2P" or higher- order wake). In general, wakes became less coherent as tail flexibility increased. We compare the pressure distribution near the tail tip and the timing of vortex formation in both cases and find good agreement. Differences between self-propelled and tethered cases are detailed. Finally, we examine the effects of material resonance on force production.

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