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Distributed flexibility in inertial swimmers[1] DANIEL FLORYAN, CLARENCE W. ROWLEY, ALEXANDER J. SMITS, Princeton University — To achieve fast and efficient swimming, the flexibility of the propulsive surfaces is an important feature. To better understand the effects of distributed flexibility (either through inhomogeneous material properties, varying geometry, or both) we consider the coupled solid and fluid mechanics of the problem. Here, we develop a simplified model of a flexible swimmer, using Euler-Bernoulli theory to describe the solid, Theodorsens theory to describe the fluid, and a Blasius boundary layer to incorporate viscous effects. Our primary aims are to understand how distributed flexibility affects the thrust production and efficiency of a swimmer with imposed motion at its leading edge. In particular, we examine the modal shapes of the swimmer to gain physical insight into the observed trends.

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