

Abstract Submitted
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Resistive and reactive force production in actuated elastic swimmers¹ RAMIRO GODOY-DIANA, MIGUEL PINEIRUA, BENJAMIN THIRIA, PMMH UMR7636 ESPCI ParisTech CNRS UPMC U Paris Diderot — We study the force production dynamics of undulating elastic plates as a model for fish-like inertial swimmers. Using a beam model coupled with Lighthill’s large-amplitude elongated-body theory, we explore different localized actuations at one extremity of the plate (heaving, pitching, and a combination of both) in order to quantify the reactive and resistive contributions to the thrust. The latter has only recently been pointed out as a crucial element in the force balance of large Reynolds number swimmers [Piñeirua et al. Phys. Rev. E (2015)]. We show that this balance is modified as the frequency of excitation changes and the response of the elastic plate shifts between different resonant modes. In the heaving case for instance, higher frequencies and thus higher modes are associated to a stronger resistive contribution to the thrust, while in pitching case, at all frequencies, thrust production comes mostly from the reactive term.

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