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Numerical simulations of chordwise flexible pitching foils: are expanding or contracting forms more efficient? KAI SCHNEIDER, M2P2-CNRS & CMI Aix-Marseille University, Marseille, France, THOMAS ENGELS, M2P2-CNRS, Aix-Marseille University, Marseille, France & Institut für Strömungsmechanik und Technische Akustik (ISTA), TU Berlin, Germany, DMITRY KOLOMENSKIY, Biomechanical Engineering Laboratory, Chiba University, Chiba, Japan, JOERN SESTERHENN, Institut für Strömungsmechanik und Technische Akustik (ISTA), TU Berlin, Germany — We present three-dimensional direct numerical simulations of chord-wise flexible plates of different shape with driven pitching motion. We focus on the tip vortices originating from three-dimensional effects due to the finite span. These vortices are important when predicting the swimmers cruising velocity, since they contribute significantly to the drag force. First we consider rectangular swimmers with different aspect ratios and compare with an experimental study (Raspa et al. , Phys. Fluids 26, 2014). Then we study expanding and a contracting shapes. We find the cruising velocity of the contracting swimmer to be higher than the rectangular one, which in turn is higher than the expanding one, while the power requirements are the lowest for the contracting shape. We provide evidence that this finding is due to the tip vortices interacting differently with the swimmer.

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