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Aerodynamic Performances of Corrugated Dragonfly Wings at Low Reynolds Numbers[1] MASATOSHI TAMAI, Iowa State University, GUOWEI HE, Institute of Mechanics, Chinese Academy of Sciences, HUI HU, Iowa State University — The cross-sections of dragonfly wings have well-defined corrugated configurations, which seem to be not very suitable for flight according to traditional airfoil design principles. However, previous studies have led to surprising conclusions of that corrugated dragonfly wings would have better aerodynamic performances compared with traditional technical airfoils in the low Reynolds number regime where dragonflies usually fly. Unlike most of the previous studies of either measuring total aerodynamics forces (lift and drag) or conducting qualitative flow visualization, a series of wind tunnel experiments will be conducted in the present study to investigate the aerodynamic performances of corrugated dragonfly wings at low Reynolds numbers quantitatively. In addition to aerodynamics force measurements, detailed Particle Image Velocimetry (PIV) measurements will be conducted to quantify of the flow field around a two-dimensional corrugated dragonfly wing model to elucidate the fundamental physics associated with the flight features and aerodynamic performances of corrugated dragonfly wings. The aerodynamic performances of the dragonfly wing model will be compared with those of a simple flat plate and a NASA low-speed airfoil at low Reynolds numbers.

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