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Identification of secondary instabilities in the near wake of a blunt trailing edge profiled body[1] ROSS CRUIKSHANK, WENYI ZHAO, PHILIPPE LAVOIE, University of Toronto — Aerodynamic research into blunt trailing edge (BTE) airfoils is driven by their structural and aerodynamic advantages over sharp trailing edge airfoils. However, the wake of BTE airfoils is dominated by a vortex street, which causes increased drag. One method to reduce the spanwise coherence of the vortex street is to generate streamwise vorticity in the wake. Recent evidence suggests that the efficiency of this control method can be improved by forcing at the same wavelength as a secondary instability (SI) of the vortex street, present at Reynolds numbers (based on airfoil thickness, d) above 470. The objective of the present study was to investigate the variation of the SI wavelength at $2000 < Re_d < 35,000$, and to examine the effect of forcing on the wake topology. The velocity field in the wake of a BTE profiled model was measured using particle image velocimetry, and proper orthogonal decomposition was applied as a filter for measurement noise. It was found that, for a laminar boundary layer, the SI wavelength decreased as Re_d increased. Following boundary layer transition to turbulence, the SI wavelength was insensitive to Re_d. This study will also examine the effect of forcing at different wavelengths on the dominant spanwise wavelength of the wake velocity field.

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