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Wavelength variation in seal whisker geometries and the effect on vortex structure CHRISTIN T. MURPHY, Naval Undersea Warfare Center Division Newport, KATHLEEN M. LYONS, University of Wisconsin - Madison, WILLIAM A. HADDOCK, Brown University, WILLIAM N. MARTIN, AREN M. HELLUM, Naval Undersea Warfare Center Division Newport, KENNETH S. BREUER, Brown University, JENNIFER A. FRANCK, University of Wisconsin - Madison — Seal whiskers have a unique undulated geometry that affects water flow over the structure and influences downstream shedding. By intensifying and modifying geometric features in whisker models, we can observe their effects more clearly. In a multi-parameter analysis, wavelength is shown to be an important parameter, especially if interacting with other geometry features. This study isolated the effect of wavelength by creating four physical models of different wavelength but constant streamwise and transverse amplitudes, peak shift, and symmetry. Flow visualization in a water tunnel, in the biologically relevant Reynolds number range of 500-2000, demonstrates the ability of the undulations to enhance the spanwise momentum transport, reduce the recirculation region, and modify the frequency spectra in the recirculation region behind the whisker. To complement the experiments, direct numerical simulations (DNS) at Re 500 are performed on the four models to correlate the flow structure visualization with resulting drag coefficients, root-mean-square lift coefficients and reduced frequencies. Agreement between experiments and simulations isolates the dominant flow structures responsible for shifts in the frequency spectra over the range of wavelengths investigated.

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