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Vortex Shedding in the Wake Induced by a Real Elephant Seal Whisker JODI TURK, ALEXIS OMILION, WEI ZHANG, Cleveland State University, JEONG-JAE KIM, JEONG-JU KIM, WOO-RAK CHOI, SANG-JOON LEE, POSTECH University — Biomimicry has been adopted to create innovative solutions in a vast range of applications. One such application is the design of seal-whisker-inspired flow sensors for autonomous underwater vehicles (AUVs). In dark, cramped, and unstable terrain AUVs are not able to maneuver using visual and sonar-based navigation. Hence, it is critical to use underwater flow sensors to accurately detect minute disturbances in the surroundings. Certain seal whiskers exhibit a unique undulating three-dimensional morphology that can reduce vortex induced vibrations (VIVs) if the major axis of the whisker cross-section is aligned to the inflow. This allows the seal to precisely track prey fish upstream using solely their whiskers. The current study aims to understand the effect of a real seal whisker's morphology on the vortex shedding behavior. Despite extensive studies of wake induced by scaled whisker-like models, the vortex shedding in the wake of a real seal whisker is not well understood. A series of experiments are conducted with a high-speed Particle Imaging Velocimetry (PIV) system in a water channel to examine the vortex shedding downstream from a smooth whisker and an undulating whisker at a Reynolds number of a few hundred. Results of the vortex shedding induced by real seal whiskers can provide insights on developing high-sensitivity underwater flow sensors for AUVs and other whisker-inspired structures.

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