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Two-Phase Computational Fluid Dynamics Simulations of Dolphin Blowhole Expulsion Jets AARON ALEXANDER, RICHARD GAETA, NGO ALVIN, MITCHELL FORD, JASON BRUCK, HALEY OBRIEN, Oklahoma State University — Monitoring the well-being of the wild dolphin population poses a challenge for biologists. While dolphins in human care can be trained to provide biological samples for monitoring, other methods must be utilized to obtain samples from wild dolphins. It is known that the mucus found in the flow generated from dolphins blowholes can be tested for hormones that help understand the current health status of the dolphin. Yet, the emitted jets from dolphin blowholes have not been well characterized. In order to understand these jets so that adequate samples may be obtained by Unmanned Aerial Systems (UAS) without spooking the dolphins, a combined program of in-situ measurements, experimental setups, and computational simulations has been designed. This study comprises the computational simulation leg of the effort and uses high fidelity scans of a dolphin respiratory system to create a computational fluid dynamic (CFD) replication of the jet emitted from the blowhole. A two-phase flow model resolves the entrainment of the mucus in the expelled jet. Additionally, a cross-wind is implemented to model the effect of the head-wind generated by the forward swimming of the dolphin.

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