

Abstract Submitted
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Fan array wind tunnels: of mice and mars (and machine learning too)¹ CHRISTOPHER DOUGHERTY, MARCEL VEISMANN, ALEJANDRO STEFAN-ZAVALA, PETER RENN, MORTEZA GHARIB, Caltech — The development, evolution, and ongoing maturity of fan array wind tunnel (FAWT) technologies at Caltech (2011-present) has made it a tool of choice for real world modeling of problems not easily studied with traditional wind tunnels. The technology has promulgated across a unique and varied set of disciplines, largely due to a) the testing options afforded by an increased parameter space b) the prescriptible and reproducible nature of the flows generated and c) the overall decreased mixing lengths inherent to the design. Two recent implementations have greatly enhanced our understanding of the scope of application of this technology and will briefly be highlighted, namely a small, near-silent FAWT to aid in the neurobiological studies of mouse olfaction and a chamber-safe FAWT able to replicate the wind on Mars to supplement testing of the Mars Helicopter project for Nasa/JPL-Caltech. To highlight our approach for higher-order problems, we explore the combination of machine learning and FAWT technologies through use of reinforcement learning to generate ‘self-healing’, two-dimensional, uniform flow profiles that dynamically adapt to disturbances (such as inlet blockages) to maintain uniformity as measured downstream.

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