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Influence of Atmospheric Flow Conditions on Scalar-mediated Mosquito Behavior YI-CHUN HUANG, Princeton University, NEIL VICKERS, University of Utah, MARCUS HULTMARK, Princeton University — Mosquito-vectored diseases are increasingly problematic around the globe where they pose a current and emerging threat to public health. Female mosquitoes locate potential hosts by tracking CO2, volatile skin emanations, humidity, and thermal cues, each of which act as passive scalars that are distributed by local flow conditions. In a preliminary study, 3D field measurements of wind conditions and simultaneous mosquito captures in CO2-baited traps have shown that flight activity occurs during turbulent conditions. However, using field data, it is impossible to uncouple turbulent statistics from each other and from the mean wind speed. To fully explore the parameter space, a unique active flow modulation grid of independently operated paddles was developed. Unlike static grids that generate turbulence within a predefined range of scales, an active grid imposes variable and controllable turbulent structures onto the moving air by synchronized rotation of the paddles at specified frequencies. In the long-term, by leveraging such technology, host-seeking orientation strategies of these insects can be studied and the efficacy of traditional or new approaches that target the behavioral responses of mosquitoes can be rigorously assessed.

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