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Self-propulsion via natural convection AREZOO ARDEKANI, University of Notre Dame, MATTHIEU MERCIER[1], MICHAEL ALLSHOUSE[2], THOMAS PEACOCK, Massachusetts Institute of Technology — Natural convection of a fluid due to a heated or cooled boundary has been studied within a myriad of different contexts due to the prevalence of the phenomenon in environmental systems such as glaciers, katabatic winds, or magmatic chambers; and in engineered problems like natural ventilation of buildings, or cooling of electronic components. It has, however, hitherto gone unrecognized that boundary-induced natural convection can propel immersed objects. We experimentally investigate the motion of a wedge-shaped object, immersed within a two-layer fluid system, due to a heated surface. The wedge resides at the interface between the two fluid layers of different density, and its concomitant motion provides the first demonstration of the phenomenon of propulsion via boundary-induced natural convection. Established theoretical and numerical models are used to rationalize the propulsion speed by virtue of balancing the propulsion force against the appropriate drag force. We successfully verified the influence of various fluid and heat parameters on the predicted speed.

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