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Analysis of wall-normal jets induced by bubble oscillations on superhydrophobic surfaces[1] KIMBERLY LIU, ALI MANI, Stanford Univ — Superhydrophobic surfaces (SHS) have received significant attention for achieving drag reduction by reducing skin friction drag. Experimental results of patterned SHS have shown that pressure control can sustain wall-attached air films and that the dynamic modulation of air film height can lead to even further drag reduction. It has been observed that, under such conditions, rapid change in the height and shape of the air film can induce substantial wall-normal velocities (Wang and Gharib, J. Fluid Mech. 2020). In this work, we numerically characterize these jet-like flows structures in a laminar setting. We present an assessment of the effects of the free shear boundary condition, which corresponds to the dynamic slip condition of the experimental air films, and the effects of an otherwise no-slip boundary condition, which corresponds to unsteady wall deformation. Interaction of the induced near-wall flow structures with turbulent crossflow and implications on possible drag reduction of the turbulent boundary layer will be discussed.

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