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Characteristics of Turbulent flow over Superhydrophobic Surfaces JENNIFER FRANCK, CHARLES PEGUERO, Brown University, CHARLES HENOCH, NUWC, KENNETH BREUER, Brown University — Recent research has suggested significant modification in the structure of turbulent flow of water over a superhydrophobic surface. The changes, which may include large reductions in skin friction, are due to the modification of the no-slip boundary condition at the liquid-solid interface. We present experimental and computational results from an ongoing exploration of this system. Experimental results include new measurements of laminar flow friction coefficients, as well as high-resolution PIV over a number of superhydrophobic geometries. To complement the experimental investigations, direct numerical simulations of turbulent channel flow are performed. The no-slip boundary layer is modified with Navier slip boundary conditions in the streamwise and spanwise flow directions. The effect of compliance at the air-water interface between microstructures is investigated numerically using a simple model to calculate out-of-plane wall deflections and allow for non-zero wall-normal velocities. Mean and fluctuating velocity statistics as well as flow structures are examined, and compared with the experimental measurements.

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