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Hydraulic Jumps on Superhydrophobic Surfaces Exhibiting Ribs and Cavities MICHAEL JOHNSON, BENTON RUSSELL, DANIEL MAYNES, APS, BRENT WEBB — We report experimental results characterizing the dynamics of a liquid jet impinging normally on superhydrophobic surfaces spanning the Weber number (based on the jet velocity and diameter) range from 100 to 1400. The superhydrophobic surfaces are fabricated with both silicon and PDMS surfaces and exhibit micro-ribs and cavities coated with a hydrophobic coating. In general, the hydraulic jump exhibits an elliptical shape with the major axis being aligned parallel to the ribs, concomitant with the frictional resistance being smaller in the parallel direction than in the transverse direction. When the water depth downstream of the jump was imposed at a predetermined value, the major and minor axis of the jump increased with decreasing water depth, following classical hydraulic jump behavior. When no water depth was imposed, however, the total projected area of the ellipse exhibited a nearly linear dependence on the jet Weber number, and was nominally invariant with varying hydrophobicity and relative size of the ribs and cavities. For this scenario the Weber number (based on the local radial velocity and water depth prior to the jump) was of order unity at the jump location. The results also reveal that for increasing relative size of the cavities, the ratio of the ellipse axis (major-to-minor) increases.

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