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Laminar jet impingement and hydraulic jump behavior on a superhydrophobic surface with isotropic slip JULIE VANDERHOFF, JOSEPH PRINCE, DANIEL MAYNES, Brigham Young University — We present an analytical model describing laminar jet impingement and the resulting hydraulic jump on a flat horizontal superhydrophobic surface with uniform surface slip in all directions. Due to the relatively thin film dynamics associated with the growth of the laminar jet after impingement, the influence of slip on the fluid physics is significant. An analysis based on momentum considerations is presented that allows prediction of the relevant thin film parameters as a function of radial position from the impingement point, jet Reynolds number, and constant relative slip length of the surface. The hydraulic jump can be located as a function of the laminar jet characteristics and imposed downstream liquid depth. The results reveal that at a given radial location, for increasing slip, the boundary layer growth and thin film thickness decrease while the surface velocity of the thin film increases. Increasing slip length also leads to the formation of a hydraulic jump at increasing radial location. A prediction equation is formulated to estimate the location of the hydraulic jump as a function of the magnitude of the slip and all other influencing variables.

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