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Liquid Jet Impingement Thermal Transport on a Superhydrophobic Surface[1] MATTHEW SEARLE, DANIEL MAYNES, JULIE CROCKETT, Brigham Young Univ - Provo — Thermal transport for an axisymmetric liquid jet impinging on a horizontal constant temperature superhydrophobic surface with an imposed isotropic hydrodynamic slip length and temperature jump length has been explored analytically. The flow is partitioned into three regions: 1) a region where the hydrodynamic and thermal boundary layers are developing, 2) a region where the hydrodynamic boundary layer is developed and the thermal boundary layer is still developing, and 3) a region where both boundary layers are developed throughout the thin film. An integral analysis has been performed, where third-order velocity and temperature profiles have been assumed. A system of differential equations are solved numerically to obtain boundary layer thicknesses, local shear stress and heat flux, thin film height, and free surface temperature as functions of radial position. The solution for the no-slip scenario shows excellent agreement with previous differential analysis of the same problem. The influence of the magnitude of the slip length and temperature jump length on the thermal transport is presented for a realizable range of slip lengths and typical jet Reynolds numbers.

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