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Hydrodynamics of micro-scale surface flows induced by triangulated droplet stream impingement array TAOLUE ZHANG, JORGE ALVARADO, Texas A&M Univ, ANOOP KANJIRAKAT, REZA SADR, Texas A&M University at Qatar, TAMU-TAMUQ TEAM — A study of surface flow hydrodynamics caused by triple stream of impinging droplets arranged in a triangular array is presented. Triple streams of mono-dispersed droplets were produced using a piezoelectric droplet generator with the ability to adjust parameters such as droplet impingement frequency, droplet diameter, droplet velocity and spacing between adjacent impinging droplet streams. A translucent Zinc Selenide (ZnSe) substrate was used for characterizing the hydrodynamic phenomena of the droplet impingement zone using a high speed imaging technique. Surface jet-like fluid flows were observed among impact craters during the high-frequency droplet impingement process. A transition from laminar-like to turbulent-like surface jet flow was observed by increasing droplet Weber number or decreasing droplet impingement spacing. A correlation based on visual observations has been postulated by taking into account the droplets' Weber number (We) and non-dimensional droplet impingement spacing (S^*). The correlation has a mathematical form of $S^* \cdot We^n = K$, where K is a constant. One major result from the study is the relative accuracy of the postulated model in predicting the laminar-turbulent like transition in terms of We and S^*.

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