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Entrainment Characteristics for variable-angle plunging liquid jets SURAJ DESHPANDE, MARIO TRUJILLO, University of Wisconsin - Madison — Simulations based on an algebraic VoF method are used to study the entrainment characteristics of a water jet plunging into a quiescent pool at angles ranging from 10 to 90 deg. with pool. Our previous study of shallow plunging jets (Deshpande et al. 2012) revealed a discernible frequency in the formation of large air cavities. This contrasts the well-documented chaotic entrainment at steeper inclinations, suggesting a different entrainment mechanism exists for shallow angles. Quantitatively, it is found that larger cavities and greater volume of entrained air occur at shallower angles (10, 12 deg.). A precursor to the formation of these large cavities is the presence of a stagnation region in the zone of impingement. Using a local mass and momentum balance, we show that this stagnation region deflects the incoming jet at wide angles producing large air cavities. Entrainment in shallow jets is similar to the initial impact of the jet with a pool, but it occurs periodically. The recurrence is a consequence of jet disruption by traveling waves on the pool. Qualitative analysis, supported with simulations, demonstrates linear scaling of entrainment period with Froude number.

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