Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Computational Study of Air Entrainment by Plunging Jets – Influence of Jet Inclination SURAJ DESHPANDE, MARIO TRUJILLO, University of Wisconsin - Madison — The process of air entrainment by a continuous liquid jet plunging into a quiescent liquid pool is studied computationally. Our earlier study [APS2011] focused on shallow impacts and the discernible periodicity of air cavity formation. Here, we consider the effect of jet angle. For steep impacts, we see a chaotic formation of small cavities, in agreement with the literature. To explain the difference, we track evolution of the flow from initial impact to quasi-stationary state, for different jet inclinations. The initial impact always yields a large air cavity, regardless of jet angle. Difference emerges in the quasi-stationary state where shallow jets demonstrate the periodicity but the steep jets do not. We show that this is a manifestation of the air entrainment being a function of flow disturbance. For shallow jets, the disturbance originates from strong wavelike motion of the cavity which results in a total disruption of the jet. Thus, the resulting cavities are large and occur periodically. For the steep jets, entrainment happens by collapse of a thin gas film uniformly enshrouding the submerged jet. Such a thin film is very sensitive to the local flow disturbances. Thus, its collapse occurs stochastically all around the jet causing chaotic entrainment of small air pocket.

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Date submitted: 01 Aug 2012 Electronic form version 1.4