Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

On the importance of the Mesler entrainment mechanism in turbulent breaking waves[1] MILAD MORTAZAVI, VINCENT LE CHENADEC, DOKYUN KIM, ALI MANI, Center for Turbulence Research, Stanford University — Micro bubble generation due to liquid-liquid impact is observed experimentally for simple conditions such as droplet impact (Sigler and Mesler, J. Colloid and Interface Sc., 1989). This regime of air entrainment, called the Mesler regime, is active under certain range of parameters in terms of surface curvature and impact velocity. We have analyzed the importance of the Mesler regime in turbulent breaking waves by employing numerical simulation of a statistically stationary turbulent hydraulic jump at Reynolds number of 88000 and inflow Froude number of 2. A hybrid Lagrangian Eulerian volume of fluid method is used to capture the dynamics of the interface with density ratio of 831. Bubble statistics are compared against the experimental data of Murzyn et al. (Int. J. Multiphase Flow, 2005). Interface structure, curvature, and velocity statistics are analyzed. Our results indicate that impact events in the turbulent hydraulic jump are extremely likely to generate Mesler entrainment.

[1]Supported by the Office of Naval Research.

Milad Mortazavi
Center for Turbulence Research, Stanford University

Date submitted: 06 Aug 2012 Electronic form version 1.4