Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Sorting Category: 19. (C)

Turbulent bubbly flow under unsteady breaking waves[1]

MORTEZA DERAKHTI, JAMES KIRBY, Department of Civil and Environmental Engineering, University of Delaware — Wave breaking is a highly dissipative process, and also a source of turbulence in the ocean surface layer. It entrains a large volume of air in bubbles that rapidly evolves into a distribution of bubble sizes which interacts with fluid turbulence and organized motions, leads to a continuum time-dependent void fraction of bubbles. In this presentation, we use a 3D VOF-based Navier-Stokes solver extended to incorporate entrained bubble populations using an Eulerian-Eulerian formulation for a poly-disperse bubble phase, to consider an isolated, deep-water breaking event. We examine anisotropic non-stationary turbulence structure, momentum exchange between dispersed bubbles and liquid phase, bubble effects on mean and turbulent field, shear- and bubble-induced dissipation, bubble void fraction distribution and integral properties of the bubble plume both in spilling and plunging breakers. Comparison of mean and turbulent velocities, void fraction distributions and integral properties of the bubble plume show that the model is capable of capturing the large scale of turbulence and bubble plume kinematics and dynamics fairly well, and the inclusion of bubbles gives better results in terms of total dissipation and turbulent velocities.

[1]This study was supported by the office of Naval Research, Littoral Geosciences and Optics Program, grants N00014-10-1-0088 and N00014-13-1-0124.

Abstract _____ *Limit*

[X] Prefer Oral Session
[ ] Prefer Poster Session

Morteza Derakhti
derakhti@udel.edu
PhD Student, University of Delaware

Date submitted: 02 Aug 2013 Electronic form version 1.4