Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

On the mechanism of bound wave generation in irregular wave fields ZHOU ZHANG, YULIN PAN, Department of Naval Architecture and Marine Engineering, University of Michigan — Bound waves are short wave components on the water surface that are produced by longer waves. In spite of their ubiquity in nature and importance to remote sensing, the generation mechanisms of bound waves are still not well understood. A standard view of bound waves is that they travel at nearly the same speed as the carrier long wave. In this work, we show that this view is incomplete for an irregular wave field, for which a significant portion of the bound waves are dispersive (but not satisfying the linear dispersion relation). We propose a mechanism on the generation of bound waves as the sum and difference interactions between an arbitrary mode and the spectral-peak mode. This mechanism excellently explains the dispersive nature of the bound waves produced in potential flow simulations and two-phase Navier-Stokes simulations. Furthermore, the bound waves generated by wave breaking are studied and their effects on the small-scale wave spectra are elucidated.

Zhou Zhang
Department of Naval Architecture and Marine Engineering, University of Michigan

Date submitted: 31 Jul 2020 Electronic form version 1.4