Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Numerical resolution of bubble and droplet size distributions in breaking ocean waves[1] WOUTER MOSTERT, Princeton University, STEPHANE POPINET, Sorbonne Universite, LUC DEIKE, Princeton University — We present high-resolution direct numerical simulations of three-dimensional breaking ocean waves using the two-phase Navier-Stokes equations with surface tension. We use adaptive mesh refinement, here capable of attaining resolutions equivalent to 2048^3 cells in conventional grids, and which resolves physics of the bubble and droplet generation and breakup resulting from the wave breaking process. The bubble statistics are thus well-resolved below the Hinze scale (at which surface tension resists the deforming action of turbulent shear), showing good agreement with experiment. The droplet statistics are the most challenging to resolve numerically, and show a strong dependence on Bond number (comparing surface tension to buoyancy effects), but also show good agreement with experiment. In particular, certain aspects of the droplet distributions are reproduced similarly to recent experiment despite differences in wave initialization. Finally, we discuss numerical considerations on resolution constraints for bubble and droplet statistics.

[1]This work was supported by NSF Grant No. 1849762 to L.D. and the Cooperative Institute for Earth System Modeling between Princeton University and GFDL NOAA. Computations were partially performed using the XSEDE allocation TG-OCE180010 to W.M., which is supported by NSF Grant No. ACI-1053575.

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Date submitted: 27 Jul 2020 Electronic form version 1.4