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**Numerical Simulation of Bubbly Flow and Underwater Acoustics under Breaking Waves based on a Coupled Resolved and Subgrid Scale Bubble Method** QIANG GAO, Department of Mechanical Engineering and Saint Anthony Falls Laboratory, University of Minnesota, GRANT DEANE, Marine Physical Laboratory, Scripps Institution of Oceanography, University of California, San Diego, LIAN SHEN, Department of Mechanical Engineering and Saint Anthony Falls Laboratory, University of Minnesota — Bubbles in breaking waves play an important role in many oceanography processes, including the bubble-mediated air-sea gas transfer, production of ambient wave noise, and marine aerosol generation. To study the bubble entrainment and breaking wave acoustics generation processes, we developed a coupled resolved and subgrid scale bubble simulation method. For bubbles greater than the grid size, which are called resolved bubbles, we use a coupled level set and volume of fluid method to captured them directly. A parallel, multi-block bubble identification and tagging method is adopted to extract bubbles using both the level set and volume fraction functions. Bubbles smaller than the grid size, which are called subgrid scale bubbles, are treated with a four-way coupled polydispersed bubble model. Bubble-liquid interaction is accounted for by interfacial forces and void fraction. An underwater noise model is implemented for the generation of noise by wave breaking. It was found that our numerical method can capture the bubble size spectrum and wave noise accurately compared with experimental observations.

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