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Large Eddy Simulation including population dynamics model for polydisperse droplet evolution[1] ADITYA AIYER, Johns Hopkins Univ, DI YANG, University of Houston, MARCELO CHAMECKI, University of California, Los Angeles, CHARLES MENEVEAU, Johns Hopkins Univ — Previous studies have shown that dispersion patterns of oil droplets in the ocean following a deep sea oil spill depend critically on droplet diameter. Hence predicting the evolution of the droplet size distribution is of critical importance for predicting macroscopic features of dispersion in the ocean. We adopt a population dynamics model of polydisperse droplet distributions for use in LES. We generalize a breakup model from Reynolds averaging approaches to LES in which the breakup is modeled as due to bombardment of droplets by turbulent eddies of various sizes. The breakage rate is expressed as an integral of a collision frequency times a breakage efficiency over all eddy sizes. An empirical fit to the integral is proposed in order to avoid having to recalculate the integral at every LES grid point and time step. The fit is tested by comparison with various stirred tank experiments. As a flow application for LES we consider a jet of bubbles and large droplets injected at the bottom of the tank. The advected velocity and concentration fields of the drops are described using an Eulerian approach. We study the change of the oil droplet distribution due to breakup caused by interaction of turbulence with the oil droplets.

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