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A one-way coupled, Euler-Lagrangian simulation of bubble coalescence in a turbulent pipe flow[1] MICHAEL MATTSON, Naval Surface Warfare Center, Carderock Division, KRISHNAN MAHESH, University of Minnesota — A bubble coalescence model is developed using an Euler-Lagrangian approach for unstructured grids. The Eulerian carrier fluid is solved using large-eddy simulation (LES) and the Lagrangian particle motion is solved using one-way coupled equations relating the turbulent motion of the carrier fluid to the forces on each discrete bubble. The collision process is deterministic; bubble-bubble collisions are assumed to be binary and are modeled using a hard-sphere approach. A stochastic approach is used to model coalescence, with the probability of coalescence being a function of the bubble-bubble interaction timescale and the time to drain fluid between the colliding bubbles. Coalescence in a bubbly, turbulent pipe flow without buoyancy is simulated with conditions similar to a microgravity experiment by Colin, Fabre and Dukler [Int. J. Multiphase Flow (1991) **17**:533–544] and excellent agreement of bubble size distribution is obtained between simulation and experiment. With increasing downstream distance, the number density of bubbles decreases due to coalescence and the average probability of coalescence decreases slightly due to an increase in overall bubble size.

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