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Simulation of Bubble-Vortex Interaction by the Eulerian-Lagrangian Approach EHSAN SHAMS, SOURABH APTE, Oregon State University — We perform simulations of bubble dynamics in vortex-dominated flows, such as a line vortex, using the Eulerian-Lagrangian approach. The motion of large number of bubbles is simulated by assuming spherical, point-particles with models for added mass effects, drag, and lift forces. The bubble growth/collapse is modeled by the Rayleigh-Plesset (RP) equation using Runge-Kutta scheme with adaptive time-stepping to accurately capture the bubble dynamics. Three modeling approaches are considered: (a) one-way coupling; where the influence of the bubble on the fluid flow is neglected, (b) two-way coupling; where the momentum exchange between the fluid and the bubbles is modeled, and (c) finite-volume bubbles; where the volumetric displacement of the fluid by the bubble motion and the momentum-exchange are modeled. The bubbles spiral around the vortex and are eventually captured in the central core. The effect of bubbles on the vortex as predicted by the two-way coupling models will be discussed for both constant and time-varying bubble sizes.

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