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A Multiscale Approach to Compute Mass Transfer in Bubbly Flows[1] BAHMAN ABOULHASANZADEH, GRETAR TRYGGVASON, University of Notre Dame — Mass transfer in the liquid phase of gas-liquid multiphase flows usually takes place at a considerably slower rate than the transfer of momentum, so mass flux boundary layers are much thinner than momentum boundary layers. In Direct Numerical Simulations (DNS) the resolution requirement for flows where the Schmidt number (kinematic viscosity divided by mass diffusivity) is high are therefore significantly higher than for flow without mass transfer. While it is, in principle, possible to capture the mass transfer using adaptive grid refinement, the structure of the boundary layer is relatively simple and well understood. Here we develop a multi- scale approach to compute the mass transfer from buoyant bubbles, using a boundary-layer approximation next to the bubble and a relatively coarse grid for the rest of the flow. We show that the approach works well by comparing the results both with fully resolved simulations for modest Schmidt number and with empirical correlations for high Schmidt numbers.

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