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Two Fluid Coalescence of Drops in an Exterior Fluid CHRISTOPHER ANTHONY, MICHAEL HARRIS, OSMAN BASARAN, Purdue University — The coalescence of drops and bubbles has been investigated in numerous experimental, numerical and theoretical studies due to its prevalence in industrial and natural processes. In many studies to date, either the interior/dispersed phase (e.g. the gas inside bubbles) or the exterior/continuous phase (e.g. the air surrounding drops) has been treated as dynamically inert in order to simplify the analysis. However, in many systems of interest, the interior and the exterior phases are fluids of comparable viscosities and/or densities, and treating one as dynamically inert may be inappropriate. Indeed, theoretical arguments by Eggers et al. suggest that the interior fluid will always play a role at some early time but that this could occur at length scales below the continuum limit (e.g. with bubbles). To date, the scaling behavior predicted by Eggers et al. for viscous drops in a viscous medium has been contradicted by experimental observations and no numerical study has been able to resolve this contradiction. Here, we explore through high fidelity numerical simulations drop coalescence in an exterior medium paying particular attention to the high viscosity or creeping flow limit while also considering a limited number of cases of finite viscosity.

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