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Characterizing the dynamics of complex multifluid flows undergoing topology changes[1] GRETAR TRYGGVASON, JIACAI LU, Johns Hopkins University — Although disperse multiphase flows, where one fluid appears as discrete drops or bubbles dispersed in another contiguous phase, have been widely studied, such flows are generally only seen when the volume fractions of the fluids are very different. For comparable void fractions, particularly if the flow is turbulent, we expect to see a complex dynamic interface whose topology changes repeatedly as fluid masses coalesce and break apart. Describing and modeling such churn-turbulence flows is challenging. Approaches drawn from studies of heterogeneous solids, rheology, and premixed combustion provide some guidance, but do not cover the full complexities of a dynamic interface and fluid turbulence. The challenges involve both finding the appropriate statistical descriptions as well as the generation of coarser models. We discuss these challenges; review the various ways the flow can be described and modeled and show examples from our recent work on complex turbulent buoyant two fluid flows in vertical channels and the breakup of periodic liquid jets.

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