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DNS and Modeling of Turbulent Gas-Liquid Channel Flows[1] GRETAR TRYGGVASON, MING MA, JIACAI LU, Univ of Notre Dame — DNS studies of gas-liquid flows in vertical turbulent channels are presented. Results from a simulation of a pressure driven turbulent channel flow with a friction Reynolds number of 500 where a large number of bubbles of different sizes are injected at time zero, shows that small bubbles quickly migrate to the wall, but the flow takes much longer to adjust to the new bubble distribution. The evolution of turbulent statistic and the void fraction distribution is examined, including area concentration and the components of the area tensor. Another series of simulations of bubbles injected into turbulent channel flow, where the bubbles are allowed to coalesce and break apart, is also presented. For high enough surface tension all the bubbles coalesce into one large slug, but as the surface tension is reduced, large enough bubbles break up and the flow eventually reaches an approximate equilibrium where coalescence is matched by breakups. The resulting state generally contains bubbles with a distribution of sizes. The various quantities characterizing the flow are followed over time and their dependency of the flow parameters examined. Preliminary attempts to model the flow using a set of averaged equations, using closure relations derived from the DNS data are discussed.

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