DNS of Bubbly Flows in Vertical Channels[1] JIACAI LU, Worcester Polytechnic Institute, SADEGH DABIRI, GRETAR TRYGGVASON, University of Notre Dame — The dynamics of bubbles in upflow, in a vertical channel, is examined using direct numerical simulations (DNS), where both the flow and the bubbles are fully resolved. Two cases are simulated. In one case all the bubbles are of the same size and sufficiently small so they remain nearly spherical. In the second case, several of the small bubbles are coalesced into one large bubble. In both cases lift forces drive small bubbles to the wall, forming a bubble rich wall-layer, removing bubbles from the channel interior until the two-phase mixture there is in hydrostatic equilibrium. The same evolution has been seen in earlier DNS of bubbly upflows, but here the friction Reynolds number is higher ($Re^+=250$). The results show clustering of bubbles in the wall-layer and we examine the mechanism responsible for the clustering and identify how bubbles move in and out of the wall-layer. The dynamics of the bubbles in the channel core is compared with results obtained in fully periodic domains and found to be similar. The presence of the large bubble disrupts the wall-layer slightly, but does not change the overall picture much, for the parameters examined here.

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