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DNS of turbulent bubbly flows in vertical channels[1] JIACAI LU, GRETAR TRYGGVASON, Worcester Polytechnic Institute — Direct numerical simulations are used to examine turbulent bubbly flows in vertical channels. For nearly spherical bubbles the behavior is similar to what has been observed for laminar flows. The lateral migration of the bubbles due to lift resulted in two regions: A core where the void fraction is such that the weight of the liquid/bubble mixture balances the imposed pressure gradient (and the velocity is therefore constant) and a wall-layer that is free of bubbles for downflow and bubble-rich for upflow. For spherical bubbles in a turbulent downflow the results show that the size of the bubbles plays a relatively minor role in determining the liquid velocity, as long as the bubbles remain nearly spherical. As the void fraction is changed, we do find, however, the boundaries between the core and the wall-layer for turbulent bubbly downflows are not as sharp as for laminar downflows. For upflow, nearly spherical bubbles move to the walls as for laminar upflow, but deformable bubbles stay in the middle of the channel and have relatively little effect on the liquid flow, for the same total pressure gradient.

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