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Numerical study of heat transfer in bubbly flows in channels[1]
SAUL PIEDRA, Universidad Nacional Autonoma de Mexico, JIACAI LU, University of Notre Dame, EDUARDO RAMOS, Universidad Nacional Autonoma de Mexico, GRETAR TRYGGVASON, University of Notre Dame — The effects of bubbles on the heat transfer in channel flows is examined by direct numerical simulations (DNS), where every continuum length and time scale is resolved. Earlier simulations of bubbles in turbulent flow in vertical channels have shown that the presence of bubbles increases the Nusselt number, compared to flow without bubbles. This is the case for both nearly spherical as well as deformable bubbles, even though the flow structure is very different. Here we examine how bubbles modify the heat transfer in horizontal and sloping channels, for both laminar and turbulent flows. The results show that the bubbles generally increase the heat transfer, but the exact amount depends of the degree that the bubbles modify the structure of the flow. Preliminary efforts to use the results to aid in the development of models for the average flow are discussed and early results for more complex transient flows with bubbles of different sizes are shown.

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