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Bubble-induced turbulence study in homogeneous turbulent flow using DNS approach[1] JINYONG FENG, IGOR BOLOTNOV, North Carolina State Univ — The effect of a single bubble on the energy transfer to a homogeneous turbulent flow using DNS approach is investigated for various conditions. The single-phase turbulence is numerically generated by pressure-gradient driven uniform flow through a fully resolved turbulence generating grid. The turbulent intensity measured is uniform normal to the flow direction. The decay rate of the turbulent kinetic energy is validated against analytical power law. The collected instantaneous velocity is used as inflow condition for single-bubble simulations to study the bubble-induced turbulence (BIT). In interface-resolved two-phase simulation the bubble is kept at fixed positions by using a proportional-integral-derivative controller. This simulation set allows estimating the turbulent kinetic energy before and after the bubble, quantifying the BIT. Effects of bubble deformability, velocity and turbulent intensity are separately studied. We observe that for a nearly spherical bubble, the bubble-induced turbulence is positive, increasing the level of turbulent kinetic energy in the liquid phase. BIT is influenced by the other studied parameters and the presented work will contribute to the closure BIT model development in multiphase computational fluid dynamics modeling.

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