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Sensitivity of mixing efficiency to resolution of the buoyancy scale in large-eddy simulations of stratified turbulence SINA KHANI, Princeton University — Mixing efficiency is studied in large-eddy simulations (LES) of stratified turbulence when the grid spacing Δ varies from being $<\sim L_b$ to $\gg L_b$, where L_b is the buoyancy scale. It is shown that the irreversible mixing efficiency γ is fairly close to that resulted from direct numerical simulations (DNS) if the buoyancy scale L_b is well resolved in LES. Also, when the buoyancy scale is resolved, the vertical length scale $\mathcal{L}_{\sqsubseteq} \sim \mathcal{L}_{\lfloor}$, and we can scale γ as a function of the vertical Froude number Fr_v and turbulent Prandtl number Pr_t. If we assume $Pr_t \approx 1$, in the regime of stratified turbulence where the horizontal Froude number $Fr_h \ll 1$ and $Fr_v \sim 1$, γ goes to a constant value 1/3. This value of γ has been recently reported as an upper bound of mixing efficiency in the deep ocean stratified regions near topographies. Overall, our work suggests that similar results to those from DNS approach can be yielded in LES of stratified turbulence, while the computational costs are significantly decreased in LES in comparison with expensive DNS runs.

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