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Slow oscillation of passive scalar fluxes in stratified turbulence HIDESHI HANAZAKI, TOHRU OKAMURA, Kyoto University — Scalar fluxes in decaying stratified turbulence are investigated when vertical mean gradients of density and passive scalar coexist. Direct numerical simulations show temporal oscillations of a passive scalar flux which contain a component of double-period oscillation, as predicted by the rapid distortion theory. The slow modes appear always when there are initial density fluctuations. For passive scalars with high Schmidt number (Sc>2Pr/(1+Pr), Pr: Prandtl number of the active scalar), the slow modes become dominant at large times, and the turbulent diffusion coefficient of a passive scalar Kc decays more slowly than the turbulent density diffusion coefficient. On the other hand, at low Schmidt numbers (Sc<2Pr/(1+Pr)<2), slow mode suffers strong initial decay, so that Kc and Krho decay at similar rates. These results illustrate the importance of molecular diffusivity, initial conditions and unsteadiness in strongly stratified turbulence. Applicability of RDT is tested for a range of Reynolds numbers and Froude numbers, showing strong sensitivity to the Froude number but with weak sensitivity to the Reynolds number, in agreement with the scaling analysis.

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