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eddy mixing in jet-stream shear stratified turbulence

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Results from high-resolution, forced, three-dimensional direct numerical simulations on the vertical variability of turbulence and its outer length scales in an inhomogeneously stratified model tropopause jet are presented. Vertical scales O(1m - 50m) are resolved. Turbulent dynamics leads to the formation of an N^^2-notch (which favors gravity wave emission) well within the (temperature) mixing layer, which spans the whole jet core. We demonstrate that, in nonhomogeneous shear-stratified turbulence, scaling of various turbulent quantities (such as variances, fluxes, mixing efficiency, outer scales etc.) with respect to a single parameter typically exhibit multiple branches. Certain qualitative changes in eddy mixing during transitional regimes towards stronger stratification are highlighted. The behavior of turbulent eddy mixing parameters found in this study is consistent with some recent observational results in stably stratified shear flows in the atmosphere.In particular, the flux Richardson number increases, saturates and then decreases after a critical value of the gradient Richardson number (Rig) around 2.0. Correspondingly, there is also a transition from from a decreasing trend in the turbulent eddy mixing coefficient for momentum to an increasing one at the same critical Rig. The implication of these studies is that such transitions need to be accounted in the parametrization of microscale atmospheric turbulence.