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Turbulent/non-turbulent interface in a turbulent patch arising from a breaking internal wave TAKAHIRO KATAGIRI, TOMOAKI WATANABE, KOJI NAGATA, Nagoya University — We perform a direct numerical simulation (DNS) of the flow over a two-dimensional hill in a uniformly stratified fluid for investigating the characteristics of a turbulence patch generated by a breaking internal gravity wave. The flow over the two-dimensional hill generates the downwind rotor because of separation and reattachment and the rotor is related to the wave breaking. The visualizations of density showed that Rayleigh-Taylor instability occurs by overturning motions, generating the turbulence patch, which remains a quasi-steady state for a long time. The turbulence patch has large potential enstrophy, and the potential enstrophy isosurface is used to detect the turbulent/non-turbulent interfacial (TNTI) layer that separates the patch from the outer internal gravity wave region. The flow near the TNTI is investigated with the conditional statistics calculated as functions of the distance from the interface. The conditional average of the potential enstrophy changes more rapidly across the TNTI than the enstrophy because of the vorticity due to the internal gravity wave in the non-turbulent region. The thickness of the TNTI layer divided by the Kolmogorov scale in the patch is almost constant during the quasi-steady period. The buoyancy Reynolds number is uniform in the turbulent region far away from the TNTI, gradually decreases to the TNTI, and rapidly drops within the TNTI layer toward the non-turbulent region.

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