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On the evolution of stratified turbulent clouds ANDREA MAFFIOLI, PETER DAVIDSON, Department of Engineering, University of Cambridge, STUART DALZIEL, DAMTP, University of Cambridge, NEDUNCHEZHIAN SWAMINATHAN, Department of Engineering, University of Cambridge — The evolution of a turbulent cloud in a stratified fluid is studied by means of direct numerical simulations. The focus of the study is on the edge dynamics occurring between the turbulence and the quiescent region surrounding it. By comparing iso-surface plots of the materially conserved potential vorticity Π and the u_x velocity component (x is horizontal) it is possible to divide the edge flow into fluid intrusions and horizontally-travelling wave-packets. The 3D structure of the intrusions and the wave-packets is similar, both structures being pancake-like, and the only difference is in their extension away from the turbulent cloud. Individual wave-packets were tracked and it was found that their group speed agrees with the theoretical group speed relation for linear internal gravity waves. The wave-packets can therefore be thought of as quasi-linear finite-amplitude internal gravity waves. The kinetic energy radiated away by the waves was measured and it was found to be 15–20% of the total kinetic energy in the numerical domain. As a result, horizontally-travelling waves set off during a localized turbulence episode in the atmosphere could be important in the context of meteorology as they alter the energy and momentum budgets in different regions of the atmosphere.

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