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Turbulence and wave motion driven by horizontal shear layers below/above stably stratified regions MOHAMED MOUSTAOOUI, Arizopna State University, JULIAN C.R. HUNT, University College London, ALEX MAHALOV, Arizona State University — Analytical studies and high resolution 3-dimensional numerical simulations of a jet show how eddies in turbulent shear flows moving with mean velocity ΔU relative to external upper or lower stably stratified regions with buoyancy frequency N_o interact with these regions. Internal waves are not generated if the Richardson number is less than a critical value Ri^*. If $Ri < Ri^{'}$ the stratification only perturbs the irrotational motions outside the shear layer. But if $Ri^{'} < Ri < Ri^*$ intense interfacial shear layers forms at the top of the shear layer and then a second layer forms at a height of order w^+/N_o, that bounds a mixed layer of trapped turbulent eddies and weak mean shear. This double layer structure has similar scales as the natural layering process in turbulent stratified flows. When $Ri > Ri^*$, first the upper and then the lower interfacial layers break up, the peak shear in the interface decreases and a narrow band spectrum of internal waves are generated which propagate upwards although they do not significantly interact with the turbulence in the shear layer. The Reynolds shear stress associated with the waves varies with Ri, but over a wide range of Ri is as much as about 1/5 of the peak shear in the shear layer; when normalised on the vertical variance at the interface it increases in proportion to$\sqrt{Ri-1}$.

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