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Finite-Amplitude Anelastic Internal Wave Transmission and Reflection in Non-uniform Flow and Stratification LAUREN EBERLY, BRUCE SUTHERLAND, University of Alberta — Linear theory predicts that vertically propagating internal waves in non-uniform background flow and stratification reflect where their Doppler-shifted frequency matches the buoyancy frequency at a particular height. If the height over which the waves are evanescent is small, the waves can tunnel, partially transmitting their energy above the reflection level. Furthermore, if the waves grow sufficiently in amplitude due to anelastic effects, weakly nonlinear effects (specifically, the transient acceleration of the mean winds by the wave-induced mean flow) can further enhance transmission. These dynamics are examined through fully nonlinear simulations of anelastic waves in retrograde shear and in non-uniform stratification. For non-hydrostatic waves that are modulationally unstable, we find that transmission is enhanced across a reflection level provided it is situated sufficiently high that weakly nonlinear effects become important but not so high that the waves overturn before reaching the reflection level. More hydrostatic, modulationally stable, waves have enhanced dispersion and so behave more like linear theory predictions except that their overturning heights can be many density scale heights above the predicted level.

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