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Stability of a stratified boundary layer flow when shear and stratification are not aligned JULIEN CANDELIER, CEA, DAM, DIF, STEPHANE LE DIZES, IRPHE, CNRS, Aix-Marseille University, CHRISTOPHE MILLET, CEA, DAM, DIF — The inviscid stability properties of a boundary layer flow with a tanh velocity profile in a stably stratified fluid with a constant Brunt-Väisälä frequency is examined when the direction of the shear is inclined with an angle α with respect to the vertical direction of stratification. We show that for all Froude numbers there exists a critical angle α_c above which the boundary layer becomes inviscidly unstable. The characteristics of the unstable modes are analysed. For small Froude numbers, unstable modes are shown to be 3D radiative modes with a internal wave structure that extends to infinity. For large Froude numbers, the modes are localized in the boundary layer and their frequency and growth rate are proportional to the Brunt-Väisälä frequency. Non-Boussinesq and compressibility effects on the stability properties are also considered. The results are discussed in the context of atmospheric applications.

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