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DNS of unstable stratification in turbulent channel flow ALFREDO SOLDATI, University of Udine, FRANCESCO ZONTA, University of Torino — Turbulence subject to unstable stratification (bottom-up heating) is of great interest due to its dynamical importance in engineering and geophysical flows. Unstably-stratified flows often occur in the presence of high temperature gradients. In this situation, it is important to account for variation of the fluid properties with temperature. According to this idea, we use direct numerical simulation to analyze the physics of unstably-stratified turbulence with temperature-dependent fluid properties: specifically, viscosity and thermal expansion coefficient. Due to unstable stratification, wall-normal transport of momentum and heat increases with respect to the neutrally-buoyant case. Results show that flow modifications due to temperature-dependent properties may become important. In particular, the effect of temperature-dependent thermal expansion coefficient is to increase the wall normal transport of momentum and heat. By contrast, the effect of temperature-dependent viscosity appears negligible.

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