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Stably-stratified wall-bounded turbulence PEJMAN HADI SICHANI, FRANCESCO ZONTA, Vienna Univ of Technology , ALEKSANDR OBABKO, Argonne National Laboratory, ALFREDO SOLDATI, Vienna Univ of Technology — Stably-stratified (bottom-up cooling) turbulent flows are encountered in a number of industrial applications, environmental processes and geophysical flows. Turbulent entrainment and mixing across density interfaces in terrestrial water bodies (oceans, lakes and rivers) and in industrial heat transfer equipments are just some important examples of stably-stratified flows. In this work we use Direct Numerical Simulation to investigate the fundamental physics of stably-stratified channel turbulence under Boussinesq and Non-Oberbeck-Boussinesq (NOB) conditions. Compared to the neutrally-buoyant case, in the stably-stratified case active turbulence survives only in the near-wall region and coexists with internal gravity waves (IGW) moving in the core region of the channel. This induces a general suppression of turbulence levels, momentum and buoyancy fluxes. Our results show also that NOB effects may be important when the flow is subject to large temperature gradients. The most striking feature observed in case of NOB conditions is the generation of a strong flow asymmetry with possible local flow laminarization in the near wall region.

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