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The effect of atmospheric stability on the energetic contribution of the large scale structures in turbulent boundary layers MICHELE GUALA, LEONARDO P. CHAMORRO, SAFL, Dep. Civil Engineering, University of Minnesota, MN — Turbulent boundary layer measurements in wind tunnels and in the near neutral atmospheric surface layer outlined a significant contribution of the large scale motions to turbulent kinetic energy and Reynolds stresses for a wide range of Reynolds number, providing evidence of complex scale interactions across the wall region. In order to understand the effect of the large scales on the near wall turbulence and extend the predictive models of amplitude modulation to more realistic atmospheric conditions, different thermal stability conditions must be explored. In this study, experiments are performed in the atmospheric wind tunnel of the St. Anthony Falls Laboratory independently controlling air flow and floor temperatures. Measurements of fluctuating temperature simultaneously with the streamwise and wall normal velocity components are obtained with an ad hoc calibrated and customized triple-wire sensor. Scaling quantities and the dominant terms in the turbulent kinetic energy and temperature variance budget equations are estimated and discussed. A comparative analysis of the weakly stable, convective and neutral conditions based on the power spectra of the streamwise, wall normal and Reynolds stress contributions is presented. Appreciable differences in the energetic contributions of the large scales were observed.

Michele Guala
SAFL, Dep. Civil Engineering, University of Minnesota, MN

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