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Investigation of Wall-Detached Turbulence in the Atmospheric Surface Layer through LiDAR and Sonic-Anemometer Measurements MATTEO PUCCIONI, GIACOMO VALERIO IUNGO, University of Texas at Dallas, TRAVIS MORRISON, ALEXEI PERELET, SEBASTIAN HOCH, MARC CALAF, University of Utah, STEPHEN DRAKE, University of Nevada, CHAD HIGGINS, Oregon State University, MARCUS HULTMARK, Princeton University, ERIC PARDYJAK, University of Utah — In the context of wall-bounded turbulence, the enhanced measurements capabilities currently available to probe turbulence at very high Reynolds numbers have re-ignited investigations on Large- and Very Large-Scales of Motion (LSM and VLSM). Specifically, the contribution to the Reynolds stresses carried by detached eddies have been recently investigated for a wide range of Reynolds numbers ($Re_\tau = 10^3$ to 10^6). In this scenario, the present work focuses on a high-Reynolds number atmospheric surface layer flow probed with scanning Doppler wind LiDARs, sonic anemometers and a ceilometer at the SLTEST facility in Utah. Based on these new experimental datasets, the presence of detached eddies has been quantified throughout the whole surface layer and a possible theoretical background is provided to motivate the observed wall-normal profiles of the streamwise Reynolds stress. The contribution of this work is dual: first, the capability of the LiDAR technology to probe near-wall atmospheric turbulence is assessed; second, a theoretical support to the knowledge about the physics underlying wall-detached eddies is provided

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