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Numerical investigation on very-large-scale motions and the amplitude modulation in the atmospheric boundary layer at very high Reynolds number[1] HEHE REN, SHUJIN LAIMA, HUI LI, Harbin Institute of Technology, KEY LAB OF SMART PREVENTION AND MITIGATION FOR CIVIL ENGINEERING DISASTERS TEAM — Wall Model Large Eddy Simulations (WMLES) were carried out to investigate the spatial features of very-large-scale motions (VLSMs) in the atmospheric boundary layer flow under different surface roughness at very high Reynolds number, $o(10^6 \tilde{} 10^7)$. The simulation results display good agreement with field observation and experimental data. By pre-multiplied spectral analysis, the VLSMs reduces or even disappears with increasing roughness, which supports the Bottom-up mechanism indirectly. From the perspective of spatial correlation of flow field, the structural characteristics of VLSMs under various roughness were shown well with observation data. Furthermore, the amplitude modulation (AM) that exerted by the outer layer large-scale motions on the near-wall small-scale motions was discussed. It was found the negative maximum correlation decreases with increasing Reynolds number. And there is an approximate collapse of correlation over different magnitude in Reynolds number when scaled with outer variables. Finally, the physical meaning of the reversal in sign of correlation corresponds to the cross-point of small-scale turbulent intensity and the local peak of energy distribution was found.

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