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Roughness Effects on Organized Motions in a Wall Shear Layer Flow CHRISTIAN HAIGERMOSER, LUKAS VESELY, MASSIMILLANO LAPOLLA, MICHELE ONORATO, Politecnico di Torino, AEROTRANET GROUP TEAM — Turbulent boundary layer measurements on a zero-pressure gradient flat plate with two different roughness, a 2D and a 3D roughness, were carried out. The main object of the study was to investigate the impact of the wall roughness on the turbulent flow structures. The momentum thickness Reynolds number for the smooth wall was $\mathrm{Re}_\theta \sim 1900$. PIV measurements were taken in the streamwise wall-normal plane. The PIV images covered the whole logarithmic region and the major part of the outer layer. The instant flow images for the two roughness show features similar to the one expected in a smooth wall turbulent boundary layer, as described by Adrian et al. (JFM 2000). Statistical analysis was performed to enlighten quantitative differences between the different flow fields. For instance, two point streamwise velocity correlations show that the major effect of the roughness is to tilt the inclination of the hairpin vortex packets towards the wall normal direction; being the 3D roughness more effective in producing this displacement. Full results will be shown and discussed during the presentation.

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