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Influence of roughness on boundary layer structure and large scale circulation in turbulent thermal convection OLIVIER LIOT, QUENTIN EHLINGER, THIBAUT COUDARCHET, JULIEN SALORT, ELEONORE RUSAOUEN, BERNARD CASTAING, FRANCESCA CHILLA, ENS de Lyon — With sufficient forcing, measured by the Rayleigh number, Rayleigh-Bénard convection becomes turbulent. Influence of controlled roughness on the heated bottom plate has been studied from a thermal point of view [1]: a regime transition has been observed corresponding to an increase of the heat flux compared to a smooth plate. With a parallelepipedic convection cell where mean flow can be considered as bi-dimensional and where controlled square-studs roughness have been added, we performed PIV measurements to visualize both large scale circulation and boundary layer close to roughness. We work at Rayleigh number from 10^9 to 10^{10}, either side of the transition. We show that the boundary layer is thinner above the rougness than between row of square-studs, and a dramatic change of flow structure is observed between rougness. It is in good agreement with previous temperature measurements [2] and brings an explanation to the heat flux increase. Moreover, for large scale circulation, turbulence structure changes: velocity r.m.s. is higher than in the smooth case and presents a large dissymetry.

[1] Tisserand et al., *Physics Of Fluids*, **23**, 015105 (2011)
[2] Salort et al., *Physics Of Fluids*, **26**, 015112 (2014)

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