

Brief description of the SRV

The last decade has seen a renewed interest in Prandtl's secondary flows (SFs) of the second kind, as a number of heterogeneous surfaces have been found to promote significant SFs. These include surfaces characterised by converging-diverging riblets, sand-paper and urban roughness, uneven wear, variations in the wall shear stress. The existence of these secondary motions, modulating the mean flow, can contribute to passive scalars transport, drag and heat transfer. This SRV aimed at further our understanding of the mechanisms that produce SFs, and of the parameters that govern their nature.

SRV experience

The main experiments, the object of this SRV, took place within the fluid dynamics Laboratory at the University of Southampton in August 2018 as a culmination of several months of discussions and experimental design. Three different rough wall cases were generated and analysed during the experiments, which were carried out successfully. Insightful and novel data has been collected on alternating strips of different grit sand-paper of different width both with 3D Stereoscopic Particle Image Velocimetry and direct drag measurements. A preliminary example of the collected data is given in figure 1. All the tested surfaces were found to generate SFs; their strength is intimately linked to the wall morphology. This link is currently under investigation.

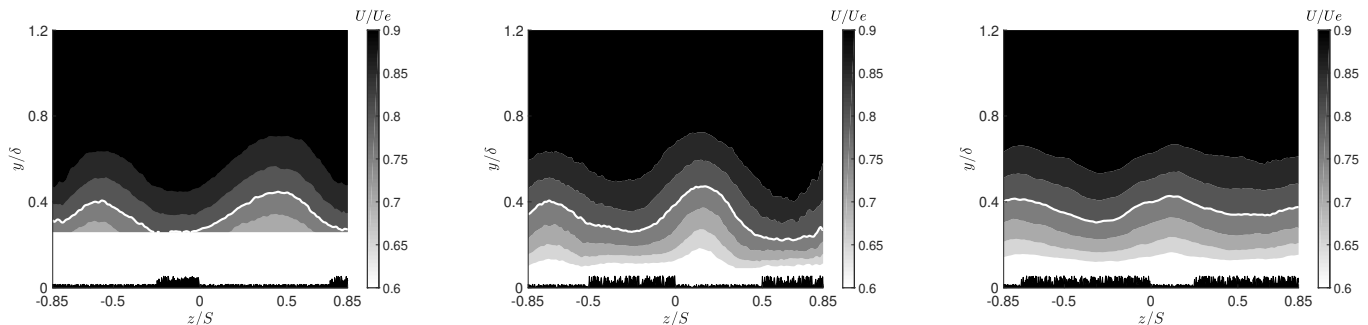


Figure 1: Contours of mean streamwise velocity over the tree surface roughnesses. The surface roughness is also reported (not in scale) for visualisation purposes.

Outcome of the SRV

The data collected during this SRV has informed collaboration of (at least) four individuals and has, so far, resulted in a paper being accepted for presentation at the forthcoming TFSP conference and associated peer-review conference proceedings*. A further output is currently being prepared for dissemination in an international peer-reviewed journal.

*Placidi, M., Medjonoun, T., Ferreira, M. A., Ganapathisubramani, B., 2019. *Secondary flows induced by spanwise heterogeneous rough walls*. 11th International Symposium on Turbulence and Shear Flow Phenomena. Southampton, UK, Jul 30 - Aug 2, 2019.