

The Effect of Inflow Conditions on Numerical Simulations of Shear Flows – Short Research Visit

Dr Andrew McMullan, University of Leicester

Visiting: Dr Elisabetta De Angelis, Dr Agustin Valera-Medina, Cardiff University

Visit dates – July 2nd – July 6th 2018.

This SRV focused on establishing collaboration between Cardiff University and the University of Leicester on the simulation of shear flows. Both institutions share an interest in this topic, including fundamental studies of mixing layers, simulations of rectangular cylinders, and shear flows undergoing combustion.

Of particular interest was the use of inflow generation techniques to capture residual fluctuations in the flow upstream of a simulation inflow plane. In mixing layers, the presence of residual streamwise vorticity in the upstream flow leads to the generation of spatially stationary streamwise structures (Figure 1). Discussions focused on how to ensure validity of the inflow generation method to produce reliable statistics on the streamwise vortex structure. It was agreed to share data between the institutions to interrogate the statistical structures present in the shear layer through the methods developed by De Angelis.

Extending the inflow generation technique to study the effects of freestream turbulence on a rectangular circular cylinder was also discussed in detail, leading to a pathway for collaboration between the institutions.

The use of Large Eddy Simulation in the role of combustor design was discussed with Valera-Medina, and has led to a joint programme of experimental and numerical simulation work of combustor design for new fuel blends.

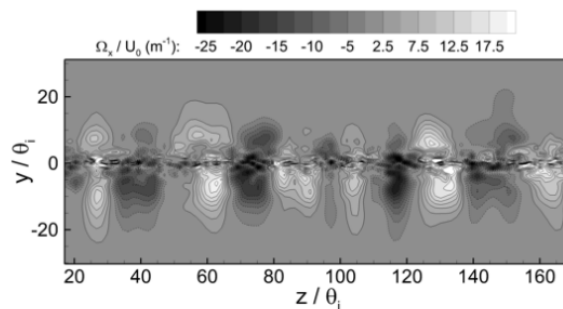


Figure 1: Streamwise vortices in a turbulent mixing layer.