Coherent Structures in the Plane Couette Flow with System Rotation

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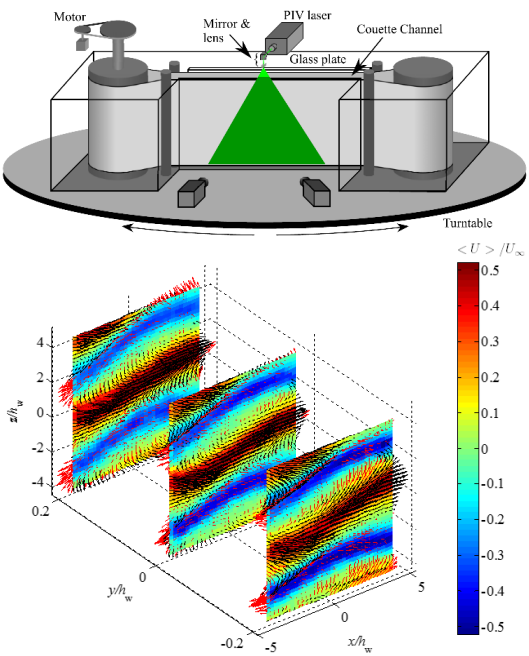

A plane Couette flow subject to system rotation is an appropriate test case to study the Coriolis force effect on flow instability, as the plane Couette flow is one of the simplest shear flows. The flow is characterized by two parameters, i.e. the Reynolds number *Re* and the rotation number Ω, which represent the inertia/viscous- and Coriolis/viscous-force balance, respectively, and it has been reported that the Coriolis force has a remarkable effect on the flow structure even when the system rotation is relatively slow. At KTH, experimental investigations of the coherent structure of this flow have been conducted using a unique facility, in which a whole system of the plane Couette flow channel is mounted on a turntable. Qualitative flow visualizations were performed in a certain range of the *Re*-Ω parameter space, and various flow states with 3D coherent structure were found (Tsukahara et al., J. Fluid Mech., 2010). Quantitative velocity measurements by planar PIV were also performed mainly at *Re* = 100 (Suryadi et al., Phys., Rev., E, 2014).

As information of the wall-normal velocity component was lacking in the previous experiments, a stereoscopic PIV system has been introduced for further investigation. Based on the measurement results, the momentum transfer in the wall-normal direction caused by the coherent structure will be investigated in detail. The range of the experimental investigation will also be expanded towards a larger area of the *Re*-Ω parameter space. Especially, the transport phenomena at the higher Reynolds number flow is our main interest.