Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

3D Evolution of Turbulent Flow Structures in Taylor-Couette SEDAT TOKGOZ, GERRIT E. ELSINGA, JERRY WESTERWEEL, Lab. for Aero & Hydrodynamics, 3ME Faculty, Delft University of Technology, Delft, The Netherlands — In this study, we use high-speed tomographic PIV to investigate the evolution of turbulent flow structures in Taylor-Couette flow. High-speed tomographic PIV enables fully volumetric time-resolved measurements and is well-suited for this purpose. Presently, the turbulent flow is created by exact counter-rotation of the cylinders ($Re_i = -Re_o$, $R_\Omega = 0.0$), where the wall velocities are the same with opposite sign. Under these circumstances, the mean flow is zero in the bulk. Results indicate that the structures still advance in one direction despite the zero mean. However, the observation time for the flow structures is still at least one order magnitude longer than in the boundary layer flows, which were considered before. Results also revealed the presence of azimuthal velocity streaks. It is found that the intense vortical structures are mostly located in the shear layer between these streaks. Different events regarding the evolution of the vortical structures, such as stretching and break-up of vortices, are observed.

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Date submitted: 02 Aug 2013 Electronic form version 1.4