

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Evolution of coherent vortical structures in turbulent flow over backward-facing step PANKAJ NADGE, RAGHURAMAN GOVARDHAN, Indian Institute of Science, Bangalore — The flow over a backward-facing step represents a geometrically simple flow that exhibits both boundary layer separation and reattachment. In the present work, we use detailed PIV measurements downstream of the step to help understand the evolution of vortical structures in this flow. In particular, velocity field measurements are done in a plane parallel to the lower wall (streamwise-spanwise plane). Upstream of the step, instantaneous velocity fields in this plane show counter-rotating vortical structures that are signatures of the three dimensional hairpin vortex structures present in turbulent boundary layers. These counter-rotating structures can be identified by the low streamwise velocity that exists between them. Conditional averaging of velocity fields gives clear counter-rotating structures whose length-scales can be measured. For the present case of a backward-facing step, the flow is evolving with streamwise distance after the step. Using similar techniques, we identify such counter-rotating structures downstream of the step; starting from near the step in the separated shear layer, all the way until well after shear layer reattachment on to the lower wall. Details about these structures and their evolution with streamwise distance will be presented at the conference.

Raghuraman Govardhan
Indian Institute of Science, Bangalore

Date submitted: 03 Aug 2012

Electronic form version 1.4