IDENTIFICATION OF COHERENT STRUCTURES IN LES FLOW FIELDS

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In the last two decades the concept of coherent structures was born and grew in importance in the study and understanding of the physics of turbulence. The ability of isolate, study and analyze the coherent structures constitutes a basic role in the current turbulence research.

In the present work the VKI-LES code was used as a numeric lab and research facility in order to compute suitable channel-flows looking for coherent structures. The procedure outlined consists in four steps.

The study of the coherent structures is performed using instantaneous 3D flow fields obtained by Large Eddy Simulation. The LES code developed at the VKI is used to produce the afore-mentioned flow-fields.

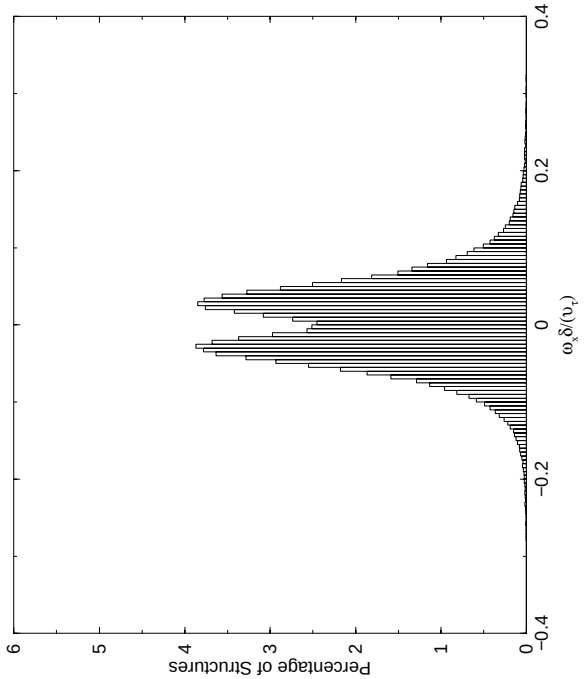
The structures are detected using the Jeong and Hussain criterion[1].

The structures are identified by an ad hoc developed algorithm, able to identify connected volume of space.

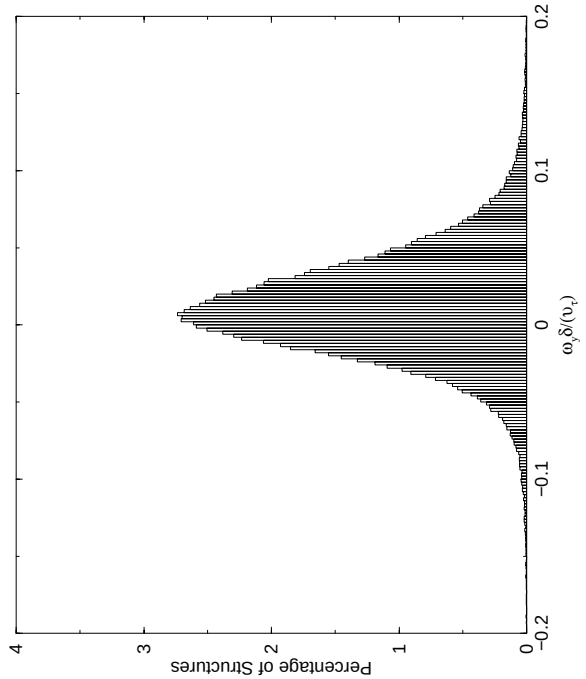
A database of structures is generated at run-time.

The data are processed and the *statistical analysis* is performed.

The classical Eulerian statistics are improved using the new possibilities offered by the identification of the structures. New statistics are retrieved, i.e. the probability distribution function of different quantities of relevant importance. The localization in space of the structures confirms the existence of a very energetic zone close to the buffer region of the turbulent boundary layer.



Streamwise vorticity



Spanwise vorticity

1. Jeong J. & Hussain F., On the identification of a vortex, 1995, J. Fluid. Mech., Vol. 285, pp. 69-94