Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Coherent vorticity extraction in turbulent boundary layers using orthogonal wavelets[1] GEORGE KHUJADZE, Group of Fluid Dynamics, Mechanical Engineering, TU Darmstadt, Germany, ROMAIN NGUYEN VAN YEN, LMD-CNRS, Ecole Normale Superieure Paris, France, KAI SCHNEIDER, M2P2-CNRS & CMI Aix-Marseille University, France, MARTIN OBERLACK, Group of Fluid Dynamics, Mechanical Engineering, TU Darmstadt, Germany, MARIE FARGE, LMD-CNRS, Ecole Normale Superieure Paris, France — High resolution direct numerical simulation data of turbulent boundary layers are analyzed by means of wavelets. The developed anisotropic wavelet transform reinterpolates the data in the wall normal direction, originally given on a Chebychev grid, onto an adapted dyadic grid. The contructed wavelet bases accounts for the anisotropy of the flow by using different scales in the wall normal direction and in the planes parallel to the wall. Therewith the vorticity field is decomposed into coherent and incoherent contributions. It is shown that few wavelet coefficients retain the coherent structures of the flow, while the majority of the coefficients corresponds to a structurless noise like background flow. Scale and direction dependent statistics in wavelet space quantify the properties of the total, coherent and incoherent flows as a function of the wall distance.

[1]Part of this work has been performed during the CTR 2010 summer program, and we acknowledge partial funding by Stanford University - NASA Ames, USA.

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Date submitted: 05 Aug 2010 Electronic form version 1.4