Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Structural Composition and Turbulent Mixing Mechanisms of a Subsonic Boundary Layer[1] PATRICK BECHLARS, RICHARD SANDBERG, University of Southampton, AERODYNAMICS AND FLIGHT MECHANICS GROUP - SOUTHAMPTON TEAM — Turbulent mixing is a key mechanism for redistributing energy in a wide range of flows. The effect of this mixing on the flow is similar to that of viscous diffusion and the process is therefore often described as turbulent diffusion. Turbulence models based on the Boussinesq approximation rely on the accuracy of the model's description of the mixing to capture the correct energy redistribution. In this presentation the basic mechanism is illustrated using a subsonic turbulent boundary layer (TBL) as a case study, and the direct influence of turbulence on the mean flow is quantified. Through a characteristic analysis the structures involved in the mixing mechanism are identified and further analyzed. The key structures for the mixing in a TBL are large clusters of smaller turbulent structures that are known as large scale motions (LSMs). While the smaller structures are located in the near-wall region they mainly align in the stream-wise direction and pack densely, which affects production and dissipation. Within the LSMs the single vortices reach towards the outer regions and develop an arbitrary alignment as soon as their distance to the wall is sufficiently large. The discussed mechanisms are not limited to TBLs and a comparison to a jet flow is provided in the talk.

[1]The authors acknowledge EPSRC for supporting this project under the grand number EP/I003754/1.

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Date submitted: 28 Jul 2015 Electronic form version 1.4