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Combining time-resolved multi-point and spatially-resolved measurements for the recovering of very-large-scale motions in high Reynolds number turbulent boundary layer

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Abstract

A methodology to recover very-large-scale motions based on the combination of time-resolved multi-point measurements and spatially-resolved full field information is here presented and applied to a high Reynolds number turbulent boundary layer flow developing over a flat plate. These very-large-scale motions are characterised by a large degree of persistence, both in time and space, and are believed to play an active role in the development of turbulence in the near-wall region Bandyopadhyay and Hussain (1984); Chung and McKeon (2010); Hutchins and Marusic (2007a); Marusic et al. (2010a). Due to the very large streamwise extent of these structures and of their meandering nature, point-measurement techniques or low time-resolved full field techniques such as Particle Image Velocimetry (PIV) offer a limited view when used alone. In the present paper, a time-resolved estimate of the full velocity vector field in a spanwise / wall-normal plane is obtained by combining low-repetition two-dimensional stereo-PIV mea-

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