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Investigation of Prandt's secondary motions in a high Reynolds number duct flow ALFREDO PINELLI, ALESSANDRO MONTI, MOHAMMAD OMIDYEGANEH, City University of London UK, MARCO ROSTI, KTH Royal Institute of Technology, Mechanics. Sweden — We have performed a series of wall-resolved Large Eddy Simulations of the flow in a long square duct at moderately high Reynods number (i.e., length 30 h, h being the duct semi-height and $Re_b = U_{bulk}h/\nu \simeq 20000$). Under this condition large and very large scale structures starts to appear as shown by the bimodal character of the pre-multiplied spectra of the streamwise velocity fluctuations. Apart from giving a full characterization of the large scale structures in a flow that presents two non-homogeneous directions we also investigate the pattern and origin of the secondary mean flow. In particular, following early results obtained by DNS at low Reynolds numbers that have put forward the hypothesis that the typical pattern of the secondary motion in a duct is mainly determined by the the footprints of the statistically preferred location of streamwise oriented coherent structures (Pinelli et al. JFM 644, 2010), we investigate the impact of large and very large scale coherent motions on the structure of the mean motion in a duct flow when scale separation starts to appear. A number of numerical experiments is also carried out with the aim of determining the eventual self sustenance of a flow that lacks close-to-the-wall coherent motions.

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