Is secondary flow of Prandtl's second kind due to intense Reynolds-stress events?[1] ATZORI MARCO, RICARDO VINUESA, Linné Flow Centre, KTH Mechanics, ADRIÁN LOZANO-DURÁN, Center for Turbulence Research, Stanford University, PHILIPP SCHLATTER, Linné Flow Centre, KTH Mechanics — We investigate intense Reynolds-stress structures in the turbulent flow through ducts square and rectangular cross-sections, with the aim of clarifying their relation with the secondary flow of Prandtls second kind. The intense Reynolds-stress structures are defined as connected regions of the domain that fulfil the condition $|uv| > Hu'v'$, where u and v are the fluctuations of the streamwise and vertical component of the velocity, respectively, u' and v' are their root-mean-square, and H is a scalar threshold. In particular, we focus on the fractional contribution of these events to the mean vertical velocity, V. The comparison between duct and channel flows unveils that: 1) in the core of the duct, the fractional contribution is in very good agreement with that in the channel, despite the presence of the secondary flow in the duct; 2) in the corner of the duct, the fractional contribution is in good agreement with the channel only in a small region below the corner bisector. Both in the core and in corner of the duct, the behaviour of the fractional contribution as a function of the wall distance is significantly different from that of V. According to our results, the secondary flow of Prandtls second kind is not due to intense Reynolds-stress events.

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