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Lagrangian study of acceleration in a turbulent channel flow JUAN IGNACIO POLANCO, IVANA VINKOVIC, LMFA, Université Lyon 1, INSA Lyon, Ecole Centrale Lyon, CNRS UMR 5509, NICKOLAS STELZENMULLER, NICOLAS MORDANT, LEGI, Université Grenoble Alpes, CNRS UMR 5519 — A Lagrangian characterisation of a wall-bounded turbulent flow is presented. Tracking of fluid tracers is performed in experiments and direct numerical simulations of channel flow at $Re_\tau \approx 1450$. Near the channel walls, the presence of large-scale streamwise vortices is associated with high-magnitude centripetal accelerations of tracer particles. This presents a clear signature on time autocorrelations of particle acceleration. Temporal cross-correlations and joint probability density functions of acceleration are used to describe the dependency between acceleration components. It is found that, near the walls, negative streamwise accelerations are associated with wall-normal accelerations directed towards the channel centre. This is due to the combined influence of viscous effects and wall-confinement. Good quantitative agreement between experiments and simulations is obtained. Preliminary results on relative dispersion of fluid particle pairs in channel flow are presented and compared with theoretical scalings derived for homogeneous isotropic turbulence. Presented Lagrangian properties can serve as basis for stochastic modelling of transport and dispersion of pollutants by atmospheric flows.

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