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Temporal characterization of turbulence and coherent structures in a recirculating flow JESUS RAMIREZ-PASTRAN, CARLOS DUQUE-DAZA, Department of Mechanical & Mechatronics Engineering, Universidad Nacional de Colombia, Bogota, Colombia, DUNCAN A. LOCKERBY, School of Engineering, University of Warwick, Coventry CV4 7AL, UK — Analysis of the temporal behavior of a recirculating flow is performed by numerical experiments on a lid-driven cavity setup. Simulations at two Reynolds numbers, based on the cavity depth (Re=3200 and Re=12000), were computed for an incompressible turbulent flow using LES. Good agreement was observed with results reported for velocity profiles along vertical and horizontal planes, but discrepancies against experimental data were found for the fluctuating velocity profiles. By using long-term simulations a complex quasi-periodic behaviour is observed and a set of dominant frequencies identified. Such behaviour is also identified by examining the temporal evolution of the TKE production and viscous dissipation terms. Coherent structures based on the Q-criterion are calculated and used to characterize the quasi-periodic behavior. Simple correlations are established between the structures and the TKE terms. Results seem to indicate that the apparently unstable behaviour is promoted by the existence of two internal flow streams, located at the side walls, and which collide at a region around the centre of the cavity. It is concluded that this interaction is responsible for the appearance of the rich set of frequencies observed at the different locations within the recirculating flow.

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