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Topology of three-dimensional steady cellular flow in a two-sided lid-driven cavity FRANCESCO ROMANO, TU Wien, STEFAN ALBENSOEDER, Carl von Ossietzky Universität Oldenburg, HENDRIK KUHLMANN, TU Wien — The topology of a laminar three-dimensional flow in a rectangular lid-driven cavity is investigated. A two-dimensional flow in the (x,y) plane is driven by two facing walls moving in opposite directions with equal velocities. The cross-sectional aspect ratio in the (x,y)-plane is 1.7. The cavity is assumed to be infinitely extended in the spanwise (z) direction. At a Reynolds number $Re = 212$ the flow becomes three-dimensional via an elliptic instability resulting in a steady cellular flow with spanwise half-period of $\lambda_z/2 = 1.365$. The nonlinear steady flows at $Re = 500$ and 700 are accurately computed using a Chebyshev spectral collocation method. The flow is analyzed with respect to regular (KAM tori) and chaotic regions. The shape of the KAM tori and associated closed streamlines as well as their dependence on the Reynolds number is discussed. Further considerations will be given to the symmetry, period and minimum distance between the KAM tori and the cavity walls.

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