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Slow dynamics in a highly turbulent von Kármán swirling flow
MIGUEL LOPEZ, JAVIER BURGUETE — In this work we present an experimental analysis of the dynamics of the coherent structures that appear in a von Kármán swirling flow, in a fully developped turbulent regime. The objective is to determine the effect of the fluctuations in the dynamics of these vortices. To achieve this goal, we have measured the flow in a water experiment. The fluid has been stirred in a cylindrical cavity up to a Reynolds number of 10^6. We show that the average velocity field of the turbulent flow bifurcates subcritically breaking some symmetries of the problem and becomes time-dependent because of equatorial vortex moving with a precession movement. This subcriticality produces a bistable regime, with a hysteresis region for an extremely small range of parameters. Three different time-scales are relevant to the dynamics, two of them very slow compared to the impeller frequency. We have studied the different time scales of the system, changing a enclosure volume (neutrally buoyant spheres) assuming that the density of the sphere is homogeneous. Also we change the frequency of the impellers ($10Hz$ - $50Hz$) to explore another parameter of the system. We follow this volume in a period of time and we compare the results in different spatial scales.

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