Phase Transition in a Closed Turbulent Flow

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Using stereoscopic particle image velocimetry, we experimentally study the susceptibility to symmetry breaking of a closed turbulent von Kármán swirling flow from \(Re = 150\) to \(Re \approx 10^6\). We report a divergence of this susceptibility at an intermediate Reynolds number \(Re = Re_\chi \approx 40000\) which gives experimental evidence that such a highly space and time fluctuating system can undergo a “phase transition”. This transition is furthermore associated with a peak in the amplitude of fluctuations of the instantaneous flow symmetry corresponding to intermittencies between spontaneously symmetry breaking metastable states.

Références