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Bifurcation induced by the aspect ratio in a turbulent von Karman swirling flow[1] JAVIER BURGUETE, Universidad de Navarra, Spain, OLIVIER LIOT, LAAS-CNRS, France — Two counter-rotating propellers are used to develop turbulence in a cylindrical cavity filled with water. The counter-rotating swirling flow can be the place of multistability, memory effects, and long time dynamics. De la Torre and Burguete [Phys. Rev. Lett. 99, 054101 (2007)] observed a symmetry breaking of the mean flow where the shear layer between the two counter-rotating cells of the flow does not remain in the middle of the cavity. Moreover, this shear layer can spontaneously jump from one side of the cavity to the other with a long residence time (typically 1000 s) compared to the turbulent time scales. But what is/are the problem parameter(s) which fix(es) the position of the shear layer and the spontaneous reversals? Here we analyze this bifurcation: It appears modifying the aspect ratio $\Gamma = H/D$. Whereas for low Γ the shear layer position has a smooth evolution when turning the asymmetry between the rotation frequency of the propellers, for high Γ the transition becomes abrupt and a symmetry breaking appears. Secondly we observe that the spontaneous reversals with large residence times exist only in a narrow window of aspect ratio. We present a phenomenological model that describres these features.

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