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Pendulum in a Flow: Case of a Balanced Pendulum ARIANE GAYOUT, Laboratoire de Physique, ENS de Lyon, CNRS, France, ARMANN GYLFASON, School of Science and Engineering, Reykjavik University, Iceland, NICOLAS PLIHON, MICKAEL BOURGOIN, Laboratoire de Physique, ENS de Lyon, CNRS, France — Fluid-structure interactions are the basics of the complexity of Aerodynamics, enhancing resonance in structures and turbulence in flows. Even simple systems like a pendulum can become more complex, as a hysteretic bistability shows up for a range of flow velocities when the pendulum confronts a flow. This is predicted by a simple balance of weight and aerodynamical forces, but non stationary response can be seen through spontaneous transitions between both stable positions. This dynamic can also be observed when substracting the weight of the pendulum. By analyzing trajectories in different phase spaces, we recover a stochastic measurement of the drag and lift coefficients. Moreover, the pendulum oscillates around the horizontal at a frequency that is linked to the evolution of the normal drag coefficient with the angular position of the pendulum. The instantaneous lift and drag coefficients inferred from the dynamical behavior of the pendulum seems to be governed by the dynamical vortex shedding phenomena, which we currently investigate experimentally.

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