Experimental Evolution of Local and Global Variables in the Subcritical Transition in Channel Flow

JOSE EDUARDO WESFREID, GREGOIRE LEMOULT, JEAN-LUC AIDER, PMMH (ESPCI-CNRS) Paris, France —

We perform experiments on the subcritical transition to the turbulence in a water channel with plane Poiseuille flow, perturbed by controlled injection of water normally to the wall. For different values of Reynolds number $Re$ and different amplitude of the perturbation $u_{jet}/u_{cl}$, we observed different states from laminar to turbulent. Using Particle Image Velocimetry, we study the dynamics of a local variable of the velocity field as the transverse magnitude and simultaneously we follow a global one, as the deformation of the mean velocity profile $\bar{u} = \bar{u}_{cl}/\bar{u}_{cl unperturbed}$. We discuss the evolution in the phase space of those variables as a function of the strength of the perturbation, and compare it with predictions made from low dimensional models.