Convective instability in inhomogeneous media: Impulse response in the subcritical cylinder wake

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ABSTRACT

We study experimentally the impulse response of a cylinder wake below the critical Reynolds number of the Bénard-von Kármán instability (see figure 1). In this subcritical regime, a localized inhomogeneous region of convective instability exists which causes initial perturbations to be transiently amplified. The aim of this work is to quantify the evolution resulting from this convective instability using two-dimensional particle image velocimetry in a hydrodynamic tunnel experiment. The velocity fields allow us to describe the evolution of wave packets in terms of two control parameters: the Reynolds number and the magnitude of the imposed perturbation. The temporal evolution of energy exhibits a transient algebraic growth at short times followed by an exponential decay. [1]

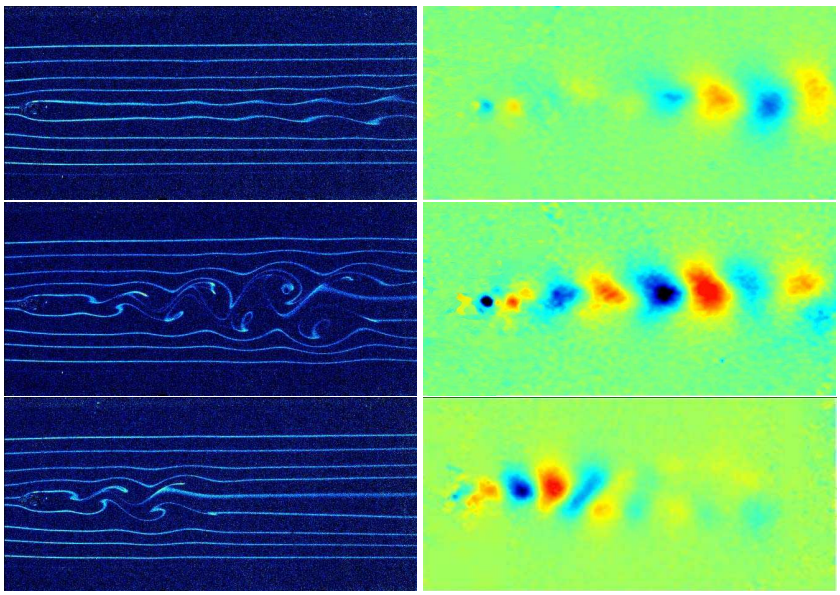

Figure 1: Visualization of the impulse response at three successive time instants (from bottom to top) in the cylinder wake. Left: streaklines obtained from Fluorescein dye visualization. Right: instantaneous cross stream velocity field obtained from PIV measurements.

REFERENCES

[1] C. Marais; R. Godoy-Diana; D. Barkley & J. E. Wesfreid. *Convective instability in inhomogeneous media: impulse response in the subcritical cylinder wake*, Phys. Fluids, **23**, 014104, 2011.