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Convective instability in inhomogeneous media: the impulse response in a subcritical cylinder wake CATHERINE MARAIS, RAMIRO GODOY-DIANA, PMMH UMR7636 CNRS, ESPCI, Paris 6, Paris 7, DWIGHT BARKLEY, Mathematics Institute, University of Warwick, JOSE EDUARDO WESFREID, PMMH UMR7636 CNRS, ESPCI, Paris 6, Paris 7 — We study experimentally the impulse response of a cylinder wake below the critical Reynolds number of the Bénard-von Kárman instability. In this subcritical regime, a localized region of convective instability exists which determines an initial perturbation to be transiently amplified. Previous experimental works [Le Gal and Croquette, Phys. Rev. E 62, 4424 (2000)] have used the spatiotemporal evolution of streaklines from dye visualizations to analyze the evolution of a wave packet, but this has not permitted to give a correct picture of the transient energy growth. The aim of this work is to quantify the evolution of this convective instability using 2D particle image velocimetry in a hydrodynamic tunnel experiment. The velocity fields allow us to describe the evolution of the wave packet in terms of two control parameters: the Reynolds number and the strength of the imposed perturbation. The energy exhibits a transient algebraic growth followed by an exponential decay. A scaling law with respect to the Reynolds number was evidenced for the later decay, but not for the initial growth, which is consistent with the picture of transient growth in inhomogeneous media governed by the interaction of non-normal modes.

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