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A scenario for transition to turbulence in a rotating boundary layer BERTRAND VIAUD, CReA, ERIC SERRE, M2P2 CNRS, JEAN-MARC CHOMAZ, LadHyX CNRS — The transition process in a rotating boundary layer is numerically investigated through spectral DNS. The configuration consists of an annular cavity made of two parallel co-rotating disks of finite radial extent, with a forced inflow at the hub and free outflow at the rim. Impulsively disturbed the flow supports a self-sustained saturated wave, matching the description of a nonlinear global 'elephant' mode as described by Pier [J.FLUID MECH. 435 135 2001]. This saturated wave is shown to be itself absolutely unstable with respect to secondary perturbations of zero Floquet number, giving birth to a very unorganized state, which can be labeled as turbulent. This scenario relies on a sufficiently strong impulsive perturbation as the first global bifurcation is known to be subcritical (see Viaud, Serre & Chomaz [J.FLUID MECH. 598 451 2008]). On the other hand, strong convective instabilities, in the form of traveling wave packets coming from upstream, are shown to be able to inhibit the formation of the primary front, thus impairing this scenario.

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