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Global stability of the boundary layer over a rotating disk in an annulus BERTRAND VIAUD, CReA, ERIC SERRE, CNRS MSNM-GP, JEAN-MARC CHOMAZ, CNRS LadHyX — Spectral Direct Numerical simulation is applied to the investigation of the transition process in the boundary layer over a rotating disk. The configuration is made of two parallel co-rotating disks, with a forced inflow at the hub and a free outflow at th rim. The flow is controled by the rotation rate and the mass flow rate. The DNS code is used to conduct both local and global stability analysis. Local results show that the boundary layer undergoes transition to absolute instability for the same control and modal parameters as in the case of the single disk. As far as global behaviour is concerned, the flow proves to be linearly globally stable, wich is consistent with former numerical results of Davies & Carpenter [J.FLUID MECH. 486 287 2003], and experiments by Othman & Corke [J.FLUID MECH. 565 63 2006]. But on the other hand, its response to a sufficiently strong impulse perturbation shows that it is non-linearly globally unstable. Moreover, the characteristics of the non-linear global mode are in full agreement with Pier's [J.FLUID MECH. 487 315 2003] description of an elephant mode in the case of the single infinite disk. The role of this elephant mode in the transition process is further investigated. In this prospect, it's stability with regard to secondary perturbation is studied.

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