Abstract Submitted
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The competition of convective and absolute instabilities in rotating-disk flow transition[1] SHINTARO IMAYAMA, P. HENRIK ALFREDSSON, R.J. LINGWOOD[2], Linné FLOW Centre, KTH Mechanics, Stockholm, Sweden — The main objective of this experimental study is to investigate laminar-turbulent transition mechanisms in the rotating-disk boundary-layer flow. Lingwood (1995) found that the flow becomes locally absolutely unstable above a critical Reynolds number and suggested that absolutely unstable travelling waves triggered nonlinearity leading to transition. However, the growth of convectively unstable stationary vortices is also a possible alternative route if the surface roughness of the disk is sufficiently large. The convectively unstable stationary vortices are attributed to an inviscid crossflow mechanism. Flow-visualization studies and hot-wire measurements of the rotating-disk boundary layer typically capture 28-32 stationary vortices in the transition regime (e.g. Imayama et al. 2014). The hot-wire measurements presented here were performed on a smooth glass disk with a diameter of 474 mm. To excite stationary vortices disk-shaped roughness elements with a diameter of 2 mm and a height of 5 micron were put on the disk at a radial position of 110 mm. In the presentation, the details of the convectively unstable stationary vortices in the rotating-disk boundary layer are shown and compared with travelling waves and similarities/differences in the turbulent transition discussed.

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