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Evolution and scaling of a start-up vortex from a two-dimensional shear layer POORIA SATTARI, DAVID RIVAL, ROBERT MARTINUZZI, University of Calgary, CAMERON TROPEA, Technische Universitaet Darmstadt — The formation process of a vortex due to the impulsive start of a shear layer plays an important role in a large number of industrial and biological systems. From the point of view of aerodynamic efficiency and momentum transfer, reaching higher levels of circulation prior to the release of the vortex can often be advantageous. For this reason the determination of a possible limit to vortex size would be an important step forward in our understanding of the vortex pinch-off process. In the present work, the evolution of an isolated line vortex generated by a starting two-dimensional jet is studied experimentally with the aid of time-resolved PIV. Unlike previous studies, this current experiment is not restricted by any interactions with other vortical structures or walls that potentially limit vortex size. By tracking the circulation, size and position of the vortex relative to the shear layer, we were able to identify the limit to vortex growth and therefore better understand the physical pinch-off process. Furthermore, in the absence of inherent velocity and length scales, alternative parameters for the scaling of circulation based on shear-layer characteristics are proposed instead.

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