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Instability of a junction vortex TAKASHI NAITOH, Department of Engineering Physics, Electronics and Mechanics, Nagoya Institute of Technology, JAMES ALLEN, Department of Mechanical Engineering, New Mexico State University — The flow field in the region where a moving wall, started from rest, slides under a stationary one, produces an interesting flow phenomena with relatively simple generation geometry. Experiments show that if the wall speed is high enough a vortex forms close to the junction of the moving wall with the stationary one. Vortex formation was observed for the range of Reynolds number $5 \times 10^2 \rightarrow 5 \times 10^5$, where the length scale is the distance the wall has moved from rest. The data reveals that in the absence of an apparatus length scale, the vortical structure appears to scale in a self- similar fashion that is consistent with the impulse provided by the moving wall. Over this Reynolds number range the vortical structure, which is initially laminar, begins to transition at 16×10^3 and appears to be turbulent by 40×10^3. The transitional regime is marked by the appearance of an instability wave on the perimeter of the vortical structure. The instability mechanism appears to be centrifugal in nature. The formation and non-linear growth of these structures and their ingestion into the primary vortex core is what causes the eventual breakdown of the primary vortex.

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