Merger of multiple vortices ROHITH V SWAMINATHAN, RAMA GOVINDARAJAN, Engineering Mechanics Unit, JNCASR, Bangalore, India — We study the merger of three or more identical co-rotating vortices initially arranged on the vertices of a regular polygon, and compare it to the merger of two like-signed vortices. The latter is a well studied problem, with the merger process there consisting of four stages. In the multiple (three or more) vortex case, we find a new stage in the merger process, where an annular vortical structure is formed and is long-lived. We find that merger on the whole is slowed down significantly as the number of vortices goes up, and the formation of the annular structure is primarily responsible for the delaying of the merger. Vortices initially elongate radially, and then reorient their long axis closer to the azimuthal direction, and then diffuse out to form an annulus. The inviscid case is similar at short times, but at longer times, rather pronounced filaments are visible, which are practically absent in the viscous case. The formation of an annular structure is further impeded since the azimuthal alignment is reduced. The annular stage will be contrasted with the "second diffusive stage" in two-vortex merger.

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