

Abstract Submitted
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The relationship between vortex pinch-off and the distribution of vorticity, momentum and kinetic energy during vortex formation TAIT POTTEBAUM, University of Southern California — A vortex that develops from a shear layer will grow as additional vorticity is added to the vortex from the shear layer. Eventually, pinch-off occurs and the vortex ceases to accept additional vorticity from the shear layer. This occurs for shear layers produced by starting jets and plumes as well as separated boundary layers from bluff-bodies. Existing models that explain pinch-off in terms of kinetic energy flux rely on an artificial boundary between the vortex and the shear layer during the formation process across which fluxes can be defined. This boundary is not physical, as the shear layer and vortex are intermingled until pinch-off is complete. In the present work, the evolution of the of vorticity, momentum and kinetic energy fields in the shear layer and vortex are measured throughout the vortex formation process. The role of these quantities in the mechanism of pinch-off is examined by using Lagrangian coherent structures to identify fluid parcels that will end up in the vortex. Results using experimental data for a starting buoyant plume and a cylinder wake will be presented.

Tait Pottebaum
University of Southern California

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