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**Early pinch-off in formation of consecutive vortex rings due to vortex interaction** JIFENG PENG, University of Alaska Fairbanks — The formation of an isolated vortex ring from a starting jet is a limited process described by the non-dimensional formation time. During formation, the vorticity flux of the jet shear layer is entrained into the forming ring until the formation time reaches a limit, upon which the ring pinches off from the trailing jet (Gharib et al. 1998). The limiting formation time can be attributed to the Kelvin-Benjamin principle, which dictates that pinch-off occurs when the shear layer is no longer able to deliver the energy required for the existence of a steady vortex ring. In formation of consecutive vortex rings from a pulsed jet, due to interaction between vortex rings, the limiting ring growth process depends not only on the formation time, but also on the pulsing frequency of the jet. This experimental study on a classic piston-cylinder arrangement finds that when pulsing frequency is high and interaction between rings is strong, the forming ring pinches off at a significantly smaller formation time compared with that in isolated ring formation. A theoretical model is developed to explain the reduced limiting formation time in consecutive ring formation.

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