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Starting jets of finite width and formation time of vortex dipoles YAKOV AFANASYEV, Memorial University of Newfoundland — Evolution of a two-dimensional flow induced by a jet ejected from a nozzle of finite size is studied experimentally. Vortex dipole forms at the front of the developing flow and then moves forward with constant speed. Trailing jet establishes behind the dipole. The dynamics of the flow is discussed on the basis of detailed measurements of vorticity and velocity fields which are obtained using particle image velocimetry. It is found that within the range of control parameters used in our experiments the dipoles never separate from the jet which is in contrast to the behavior of vortex rings reported previously by other authors. However, the formation time for the dipoles can be introduced such that after the formation the dipoles start moving away from the nozzle. Their dynamics after the formation is characterized by a reduced flux of vorticity from the jet. A value of the ratio of the speed of propagation of the dipole to the mean velocity of the jet is found to be 0.5 for later times of the evolution of the flow. A theoretical model is offered to predict quantitatively the initial propagation of the dipole as well as its steady-state regime.

> Yakov Afanasyev Memorial University of Newfoundland

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