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Airflow driven bubble pinch-off RAYMOND BERGMANN, ANDERS ANDERSEN, TOMAS BOHR, Department of Physics, Technical University of Denmark, DEVARAJ VAN DER MEER, Faculty of Science, University of Twente —
We create air bubbles at the tip of a "bathtub vortex" which reaches to a finite depth. The bathtub vortex is created by letting water drain through a small hole at the bottom of a rotating cylindrical container. For sufficiently large rotation rates the tip of this needle-like surface depression becomes unstable and emits bubbles. The collapse follows a $R(t) \propto \tau^{1/3}$ power law for the minimal neck radius which is indicative of the balance between liquid inertia and the under pressure due to the airflow in the neck. In a variety of systems it is the under pressure created by airflow that induces and/or propagates the pinch-off of a bubble. In a co-focused jet, and the equivalent flow-focusing devices, it is the externally induced airflow that breaks up the bubbles. In other systems the collapse itself induces an airflow which becomes dominant in the final stages of bubble pinch-off (Phys. Rev. Lett. **98**, 144503 (2007)). Our system illustrates the importance of both contributions to the airflow, i.e., the external airflow induced by surface oscillations of the tip and the airflow induced in the neck by the collapse itself. Both of these contributions are of the same order and in Bernoulli's law the unsteadiness gives rise to terms of similar order. Surprisingly enough, all of these terms contribute with the same scaling exponent to the under pressure.

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