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Buckled in translation ANKE LINDNER, ESPCI, ELIE WANDERSMANN, Leiden University, NAWAL QUENNOUZ, OLIVIA DU ROURE, ESPCI, YUAN-NAN YOUNG, NJIT, MICHAEL SHELLEY, Courant Institute, NYU —
An elastic filament can undergo a buckling instability when interacting with a viscous flow. The subsequent deformation of the filament changes its transport properties in the flow. In particular, numerical simulations (Young *et al.* Phys. Rev. Lett.,99,058303, 2007) have shown that due to its deformability an elastic filament can move like a random walker in a cellular flow, formed by closed stream lines. We have built an experimental set up using a centimeter scale filament made from a silicon elastomer in a network of counter rotating vortices allowing for a direct study of the coupling of deformation and transport. We quantify the buckling threshold in the complex flow geometry and show that it is in good agreement with analytical and numerical predictions. We directly link the observed buckling to modifications in the transport of the filament and study the probability of the filament to escape from a given vortex as a function of its deformability. We furthermore compare the transport in the vortex array of a rigid and a flexible filament to a small bead and show that not only deformability but also the size of the filament plays a crucial role for its transport behaviour.

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