Abstract Submitted
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Oscillatory bubbles induced by geometrical constraint[1] ANNE JUEL, MICKAEL PAILHA, ANDREW HAZEL, University of Manchester — Microscale process engineering requires precise control of bubbles and droplets. We investigate geometry-induced control and find that a centered constriction in the cross section of rectangular tubes can lead to new families of steadily propagating bubbles, which localize in the least-constricted regions of the cross section. Tuning the constriction geometry can cause a switchlike transition from centered to localized bubbles at a critical value of the flow rate: a mechanism for flow-rate-driven bubble control [1]. Striking and robust periodic oscillations develop on the advancing air-fluid interface that can dramatically reduce the volume of fluid extracted. The dynamics of the oscillations are consistent with their arising from a global homoclinic connection between the stable and unstable manifolds of a steady, symmetry-broken solution.

[1] A. de Lózar, A. Heap, F. Box, A.L. Hazel & A. Juel *Partially-occluded tubes can force switch-like transitions in the behavior of propagating bubbles*, Phys. Fluids. **21**, 101702; doi: 10.1063/1.3247879, 2009.

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