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Chemical fronts and waves in a chain of alternating vortices[1] TOM SOLOMON, MATT PAOLETTI[2], CAROLYN NUGENT, Bucknell University —
We present results of experimental studies of advection-reaction-diffusion phenomena in a flow composed of an oscillating and/or drifting chain of vortices in an annulus. The oscillating/drifting vortex chain flow has been shown to exhibit chaotic mixing and (in some cases) superdiffusive transport. We investigate the behavior of the Belousov-Zhabotinsky reaction in this system. We consider both the propagation of a reaction front in this system, as well as wave behavior observed for oscillatory reactions. For the front propagation, the role of coherent vortices in the flow is discussed. In particular, the front is shown to mode-lock to the external stimulus if forced periodically. We extend this result to cases in which transport is superdiffusive. For the oscillatory reaction, source-sink waves form in the diffusive regime, although the behavior of the waves continually changes during the experiments.

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