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The effects of superdiffusive transport on front[1] MOLLIE SCHWARTZ[2], TOM SOLOMON, Bucknell University — We present experimental studies of the propagation of chemical fronts in an annular chain of alternating vortices. The vortex chain can be controlled to both drift (with velocity v_d) and oscillate (with velocity amplitude v_o) in the azimuthal direction. Transport in this flow is diffusive if $v_d < v_o$ and superdiffusive if $v_d > v_o$. The chemical front is produced using the excitable state of the Ruthenium-catalyzed Belousov-Zhabotinsky reaction. Previous experiments[3] have shown that the fronts often mode-lock to the external forcing for pure oscillatory time dependence ($v_d = 0$). We investigate the limits of this mode-locking behavior as the drift is increased, studying in particular any changes that occur when the transport becomes superdiffusive. An important parameter in these studies is the ratio $\eta = U/v_{rd}$ between the maximum flow velocity U and the reaction-diffusion (no-flow) front velocity v_{rd}. We investigate changes in the observed behavior as η is increased, increasing the relative importance of fluid advection in the advection-reaction-diffusion process.

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