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**Front propagation in vortex-dominated flows**[1] GARRETT O'MALLEY, JUSTIN WINOKUR[2], TOM SOLOMON, Bucknell University — We present experiments that explore how the propagation of a reaction front is affected by a two-dimensional flow dominated by vortices. The reaction is the excitable Belousov-Zhabotinsky chemical reaction. The flow is driven by the interaction between an electrical current passing through the fluid and a spatially-varying magnetic field produced by an array of magnets below the fluid. For some of the experiments, the forcing is strong enough to produce a weakly turbulent flow. Measurements are made both of the enhanced diffusion coefficient $D^*$ describing transport in the flow and of the propagation speed $v$ of a reaction front in the same flow. Scaling of $v$ versus $D^*$ is compared with that for the standard Fisher-Kolmogorov-Petrovsky-Piskunov prediction $v \sim \sqrt{D}$ (with $D$ as the molecular diffusion coefficient) for the reaction-diffusion limit with no fluid advection. We also study the effects of superdiffusive transport and Lévy flights on front propagation in a time-dependent vortex array with wavy jet regions.

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