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Reaction fronts and synchronization in ordered and disordered vortex networks[1] TOM SOLOMON, GARRETT O'MALLEY, JUSTIN WINOKUR[2], Bucknell University — We present experimental studies of front propagation and synchronization in an advection-reaction-diffusion system. The reaction is either the excitable or oscillatory Belousov-Zhabotinsky chemical reaction, and the flow is an array or annular chain of vortices forced using magnetohydrodynamic techniques. The reaction in each vortex acts as a node in a complex fluid network, and communication between these nodes is via chaotic mixing. Mixing in this system is either diffusive (enhanced) or superdiffusive, depending on the forcing protocol. We find that the network with the oscillatory reaction synchronizes if the mixing is superdiffusive with long-range connections. We also find that reaction fronts in this system typically pin to moving vortices. We explore any changes in front propagation behavior when the transport changes from normal diffusion to superdiffusion.

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