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Frozen fronts in cellular flows[1] MOLLIE SCHWARTZ[2], Bucknell University, TOM SOLOMON, Bucknell University — We present experiments showing that cellular flows often freeze the motion of chemical fronts in the presence of an opposing uniform wind. Fronts pin to the vortex structure in a chain of counter-rotating vortices for a wide range of imposed wind speeds that grows nonlinearly with the strength of the underlying vorticity. The same phenomenon is observed in a two-dimensional, spatially-disordered array of vortices, indicating that the ability to pin fronts is a general property of vortices. We further investigate the strength of the pinning with the addition of a time-periodic (oscillatory) wind, introducing chaotic advection and potential effects of mode-locking. These results demonstrate that any general theory of advection-reaction-diffusion dynamics will have to account for the tendency of cellular structures to pin fronts.

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[2]Current address: Columbia University

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Tom Solomon
tsolomon@bucknell.edu
Bucknell University

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