Traveling fronts in time-periodic and random flows

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Abstract

I will first describe recent results on existence of traveling fronts and the speed variational principles for reaction-diffusion equations with time-periodic advection (cellular and shear flows) and nonnegative reactions. Variational principles are useful tools for obtaining properties of speed enhancement especially in case of shear flows. When the shear is a stationary random process restricted to the cross-section of a cylinder, we study asymptotics of the speed ensemble in the limit of small or large root mean square regime of the shear under certain shear moment conditions. The KPP variational formula also offers an efficient numerical method for computing the enhancement asymptotics and distributions of random speeds. Numerical results will illustrate the dependence of enhancement on shear covariance in agreement with predictions of analytical formulas.