The effect of turbulence on reaction-diffusion equations

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Abstract

Reaction-diffusion equations arise in several physical and engineering applications as they can be used to model many physical systems such as chemical reactions. It is known that strong solutions of reaction-diffusion equations may blow-up in finite time in general. Moreover, for many systems of practical interests, establishing whether the blow-up occurs or not is an open question. In this talk we show that a suitable multiplicative noise of transport type, typically used to model turbulent flows, improves this situation considerably. More precisely, we show that a sufficiently intense noise ensures the existence of strong solutions on a given finite time interval. Global existence is shown in case of exponential decreasing mass. Last but not least, an enhanced diffusion effect is also established. The arguments combine recent developments in the context of regularization by noise and in the $L^p(L^q)$-approach to stochastic PDEs.