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Controlling roughening processes in the stochastic Kuramoto-Sivashinsky equation SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London, SUSANA GOMES, DEMETRIOS PAPAGEORGIOU, GREG PAVLIOTIS, Department of Mathematics, Imperial College London, MARC PRADAS, School of Mathematics Statistics, The Open University —
We present a novel methodology to control the roughening processes of semilinear parabolic stochastic partial differential equations in one dimension, which we exemplify with the stochastic Kuramoto-Sivashinsky equation. The original equation is split into a linear stochastic and a nonlinear deterministic equation so that we can apply linear feedback control methods. Our control strategy is then based on two steps: first, stabilize the zero solution of the deterministic part and, second, control the roughness of the stochastic linear equation. We consider both periodic controls and point actuated ones, observing in all cases that the second moment of the solution evolves in time according to a power-law until it saturates at the desired controlled value. Furthermore, our control framework allows us to force the interfaces to have a prescribed shape. We observe from our numerical experiments that our results are valid for different types of nonlinearity (in particular, the Burgers and KPZ ones) as well as white and coloured noise.

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