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Noise-induced complexity in active nonlinear spatially extended systems MARC PRADAS, SERAFIM KALLIADASIS, Department of Chemical Engineering, Imperial College London, DMITRI TSELUIKO, School of Mathematics, Loughborough University, DEMETRIOS T. PAPAGEORGIOU, GRIGORIOS A. PAVLIOTIS, Department of Mathematics, Imperial College London — We study noise-induced phenomena on spatially extended systems (SES) that are close to the instability onset. We consider a degenerate noise that is acting on the subspace of stable modes only, and by means of a multiple scale analysis for general noisy SES we obtain an amplitude equation for the dominant mode. This then allows us to analytically investigate the noise effects on the dominant dynamics of the system. We observe that several non-trivial scenarios are possible depending on the stable modes the noise is acting on, including noise-induced critical transitions, intermittency and stabilisation when the noise is acting on the first stable mode only; or a noise filtering process, i.e. the dominant mode is not affected at all by the stochastic forcing when it is acting on the second stable mode. Our analytical findings are exemplified with a model SES, the noisy Kuramoto-Sivashinsky equation which describes, amongst many other different physical settings, the dynamics of a thin-liquid film flowing over a topographical substrate. In all cases, very good agreement between the theoretical predictions and numerical experiments is observed.

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