Institute for Applied Mathematics, Bonn University

Oberseminar Stochastik

Thursday, 11 January 2024, 16:30
Lipschitz-Saal (LWK 1.016)

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Pushed and pulled waves

This talk is inspired by recent findings concerning the noisy F-FPP equation with Allee effect

$$u_t = \frac{1}{2}u_{xx} + u(1-u)(1+Au) + \sqrt{\frac{u(1-u)}{N}}\eta,$$

where η represents space-time white noise, N is a large demographic parameter and A encodes an Allee effect in the population. Empirical observations and theoretical considerations point to the presence of a fascinating phase transition encompassing a pulled, a semi-pushed, and a fully pushed regime. From a biological stand point, this phase transition has some important consequences on the genetic diversity in expanding populations.
To elucidate this phenomenon, I will introduce a category of branching Brownian motions that exhibit varying branching rates. This particular model was recently proposed by Tourniaire (22) and can be seen as a modification of the well-known Berestycki, Berestycki, Schweinsberg model (13). Through my investigation, I will demonstrate the existence of a phase transition analogous to the one observed in the noisy F-KPP equation. The proof will rely on a general methodology, involving the computation of "moments" of a generalized branching process through spinal decompositions (as seen in Foutel–Rodier, Schertzer 22). I will also discuss some of the biological implications of those results.