

The spatial Muller's ratchet

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14 January 2026, 17:15 – 18:15* Berlin time
IRTG 2544: "Stochastic Analysis in Interaction"
— Berlin Probability Colloquium —

WIAS Berlin
Anton-Wilhelm-Amo-Str. 39
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Abstract

In this talk we will consider the spatial Muller's ratchet introduced by Foutel-Rodier and Etheridge (2020). This particle system represents a spatial model of an asexual population with birth and death rates that depend on the local population density. For each particle, we keep track of the number of mutations of its genotype. Moreover, at each birth event with positive probability the offspring receives an additional mutation resulting in a lower birth rate.

We show that under appropriate re-scaling, the process converges weakly to an infinite system of PDEs, confirming non-rigorous computations of Foutel-Rodier and Etheridge. Under certain conditions, we can analyse these PDEs and consider the behaviour of travelling waves exploring an empty habitat. Finally, we will also answer the question whether deleterious mutations can surf population waves. Throughout we will discuss some of the technical difficulties that arise when dealing with a non-monotone particle system with infinitely many types and long-range interactions.

This is joint work with Joao de Oliveira Madeira and Sarah Penington

*Punctual, i.e. sine tempore!