

Nonlocal advection-diffusion models for modelling organism movement and space use

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1. Abstract

How do mobile organisms situate themselves in space? This is a fundamental question in both ecology and cell biology but, since space use is an emergent feature of movement processes operating on small spatio-temporal scales, it requires a mathematical approach to answer. In recent years, increasing empirical research has shown that nonlocality is a key aspect of movement processes, whilst mathematical models have demonstrated its importance for understanding emergent space use patterns. In this talk, I will describe a broad class of models for modelling the space use of interacting populations, whereby directed movement is in the form of non-local advection. I will detail various methods for ascertaining pattern formation properties of these models, fundamental for answering the question of how organisms situate themselves in space, and describe some of the rich variety of patterns that emerge. Finally, I will show how to connect these models to empirical data on animal movement via efficient parametrisation techniques