Emergent Research:
The PIMS Postdoctoral Fellow Seminar

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Pacific Institute *for the* Mathematical Sciences

The impact of accelerating and fluctuating speeds of climate change on a population

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ABSTRACT:

Biological populations are responding to climate-driven habitat shifts by either adapting in place or moving in space to follow their suitable temperature regime. The shifting speeds of temperature isoclines fluctuate in time and empirical evidence suggests that they may accelerate over time. We present a mathematical tool to study both transient behaviour of population dynamics and persistence within such moving habitats to discern between populations at high and low risk of extinction. We introduce a system of reaction–diffusion equations to study the impact of varying shifting speeds on the persistence and distribution of a single species. Our model includes habitat-dependent movement behaviour and habitat preference of individuals. These assumptions result in a jump in density across habitat types. We build and validate a numerical finite difference scheme to solve the resulting equations. Our numerical scheme uses a coordinate system where the location of the moving, suitable habitat is fixed in space and a modification of a finite difference scheme to capture the jump in density. We apply this numerical scheme to accelerating and periodically fluctuating speeds of climate change and contribute insights into the mechanisms that support population persistence in transient times and long term.

SPEAKER BIO:

Jane Shaw MacDonald earned her PhD at the University of Ottawa, where, working with Prof. Yves Bourgault and Prof. Frithjof Lutscher, her thesis spanned subjects in mathematical ecology, numerical analysis, and computational sciences. In this work, she derived mathematical models in one and two spatial dimensions describing a population residing in a climate-driven moving habitat, she developed and validated numerical solvers for each of these models, and she applied these solvers to ecological scenarios in order to further our understanding about the impact of climate change on a species' ability to persist. Now she is working at Simon Fraser University with Prof Nilima Nigam and Prof John Stockie on the regularisation and numerical approximation of line sources and mathematical modelling of nordic skiing. In addition to her mathematical pursuits, she is a committed community servant, and in the last year co- founded Math to Power Her Life, an outreach program for middle-school, self-identifying girls to explore mathematics as a career.

For more information and registration:
https://www.pims.math.ca/seminars/PIMSPDF

ABOUT PIMS PDF SEMINARS:

PIMS ongoing lecture series featuring our Postdoctoral Fellows every three weeks. You will have the opportunity to connect with emerging research in the mathematical sciences from a PIMS Postdoctoral Fellow. PIMS PDFs are amongst the top young researchers in Canada, and this is an excellent opportunity to learn about them, and their work.