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Age-structured Diffusion in a Multi-layer Environment

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ABSTRACT

In this talk we present a mathematical model describing the dynamics of an age-structured population spreading in a one dimensional environment. Our model takes into account two important features of the population: its spatial diffusion and its age structure.

We consider a population living in a one dimensional stratified environment composed of n layers. We suppose that the age-specific fertility and the age-specific mortality depend on the layer and on a significant variable which represents a way of weighting the age distribution. The diffusion coefficients depend on both the age and the layer. We suppose that there is no diffusion through the boundary of the environment. Thus we have to deal with a system of nonlinear partial differential equations with zero-flux condition on the boundary.

This framework describes diffusion in a layered habitat, but may arise from an approximation of a continuous problem.

Under suitable assumptions, which are meaningful from a biological point of view, we prove an existence theorem for the solution of this system, using a semigroup approach, and also convergence of the multilayered model to the continuous one.

Key Words: Evolution equations, Reaction Diffusion, Multi-layer, m-accretive operators, age structure, population dynamics,

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References

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