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Talks (continued)

To accomplish this we include non-locality in the growth and competition terms where the integral kernels are now depend on characteristic length parameters α and β. Therefore, we derived a parameter space (α, β) where it is possible to analyze a coexistence curve $\alpha^* = \alpha^*(\beta)$ which delimits domains for the existence (or not) of pattern formation in population dynamics systems. We show that this curve has an analogy with coexistence curve in classical thermodynamics and critical phenomena physics. We have successfully compared this model with experimental data for diffusion of *Escherichia coli* populations.

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A stochastic reaction-diffusion-taxis model for picophytoplankton dynamics

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Abstract: The dynamics of picophytoplankton communities in marine environment is studied by a stochastic reaction- diffusion-taxis model, analyzing the time evolution of the biomass concentration along a water column. The model is based on two stochastic differential equations, where the random fluctuations of the environmental variables are considered by inserting two multiplicative noise terms. Specifically, the model describes the dynamics of diffusion of picophytoplankton biomass and nutrient concentrations. In the proposed model the marine environment is characterized by poorly mixed waters and picophytoplankton is subject to intraspecific competition for light and nutrients. By numerically solving the system equations, we obtain the spatio-temporal dynamics of phytoplankton biomass, nutrients and light along the water column at different depths. The results indicate that the distributions of the picophytoplankton biomass concentration along the water column are characterized by a peak. The comparison with experimental data show that height and localization of these peaks are in a good agreement with experimental maxima obtained from data collected in a real marine ecosystem. Finally, we consider the effect of seasonal variations of temperature by studying the picophytoplankton dynamics in the presence of a periodical driving force. The model proposed represents an improvement of previous deterministic models for phytoplankton dynamics and is able to reproduce the spatio-temporal distributions of picophytoplankton concentration observed in real marine ecosystems.