25th Marian Smoluchowski Symposium on Statistical Physics

on Statistical Physics

Kraków, Poland, September 9-13, 2012

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Sunday 09 September 2012 - Thursday 13 September 2012

Book of abstracts

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Proceedings

As usual, proceedings of the Symposium are going to be published as a special issue of *Acta Physica Polonica B*, a refereed journal recognized by The European Physical Society and Philadelphia Institute of Scientific Information. Everybody is encouraged to contribute, but the invited talks are particularly welcome. However, **all** contributions will go through the regular editorial process, inculding peer review.

Please, visit the publishers' website for instructions to authors. Please, send your contribution to the following address only: **zfs@th.if.uj.edu.pl**. Your contribution should by typeset in LaTeX, figures in Encapsulated PostScript. We are sorry but we will not be able to handle other formats, including MS Word. Please, include a PDF of your contribution with your submission.

The submission deadline is **January 4, 2013.**

Poster Session / 60

A stochastic reaction-diffusion-taxis model for two picophytoplankton populations

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In this work, the stationary distributions of two populations of picophytoplankton, i.e. picoeukaryotes and Prochlorococcus, are studied. This two groups account on average for 60% of the total chlorophyll a (chl a) and divinil chlorophyll a (divinil chl a) concentration in Mediterranean Sea. The interaction of these populations with the environment occurs through two factors that limit the growth of the aquatic microorganisms: light intensity and nutrient, i.e. phosphorus. The dynamics of the two picophytoplanktonic groups, distributed at different depth along a water column (one-dimensional spatial domain), is analyzed starting from a deterministic reaction-diffusion-taxis model. This consists of a system of three differential equations and an auxiliary equation for light intensity. By numerical methods we calculate the stationary solutions for the spatial distributions of the picophytoplankton biomass along the water column, obtaining the corresponding content of chlorophyll a and divinil chlorophyll a concentration. The results indicate the presence of a maximum of the total concentration of chl a and divinil chl a at a certain depth. Magnitude and localization of this maximum are in a good agreement with experimental findings. In order to consider the effect of the random environmental fluctuations, we modify our equations, by inserting sources of multiplicative white Gaussian noise, then we calculate from the stochastic model the new distributions for the chl a and divinil chl a concentration. The results show that position, shape and magnitude of the peaks agree with the experimental data better than those obtained from the deterministic model.