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Dynamics of a Diffusive Nutrient-Phytoplankton-Zooplankton Model with Spatio-Temporal Delay

We study a diffusive nutrient-phytoplankton-zooplankton (NPZ) model with spatio-temporal delay. The closed nature of the system allows the formulation of a conservation law of biomass that governs the ecosystem. We formulate stability conditions for the equilibria for a general distribution of delays and analyze the Hopf bifurcations for a specific delay kernel. We show that diffusion predominantly has a stabilizing effect. If sufficient nutrient is present, however, complex spatio-temporal dynamics, both transient and stable, may occur. This is joint work with Francis Poulin (University of Waterloo) and Yiwen Tao (Zhengzhou University).