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Mathematical Modeling and Analysis of a Phytoplankton Competition Model Incorporating Preferential Nutrient Uptake.

Phytoplankton live in a complex environment with two essential resources forming various gradients. Light supplied from above is never homogeneously distributed in a body of water due to refraction and absorption from biomass present in the ecosystem and from other sources. Nutrients in turn are typically supplied from below. In poorly mixed water columns, phytoplankton can be heterogeneously distributed forming various layering patterns. In this talk we present a model of two phytoplankton species competing for two nutrients, one of which is assumed to be preferred. The parameter space of the model is analyzed for parameter identifiability- the ability for a parameter's true value to be recovered through optimization, and for global sensitivity- the influence a parameter has on model response. The model is then analyzed to study how these parameters influence the outcome of population competition. In particular, conditions for population coexistence are developed. (Received September 20, 2018)