Latitudinal variation in plankton traits and ecosystem function

Abstract (250 words)

Understanding of trophic strategies of plankton is crucial to describe plankton ecosystem structure and function. For example, the presence of mixotrophs increases both primary production and the efficiency of energy transfer to higher trophic levels, and photo-acclimation is used by phototrophs to deal with varying light conditions. Mathematical models with proper adjustment of trophic strategies of plankton according to environmental conditions are lacking. Here we develop a trait-based model of unicellular plankton with cell size as the master trait and three investment traits that determine trophic strategies: investments in photosynthesis, nutrient uptake, and phagotrophy. The model use optimization of trophic strategy to reduce the number of state variables. We use the model to study the latitudinal variation of emergent plankton community structure in 1D vertical water column. The model reproduces observed latitudinal patterns in biomass and primary production. Lower latitude waters have a stable deep chlorophyll maximum dominated by obligate mixotrophs, while higher latitudes have a seasonal succession with ??. + *Some words about differences in function*. The models’ ability to adapt to different environmental conditions combined with its simple structure and few state variables makes it well suited for global simulation studies.