Developing a Numerical Box Model to Compute Algae Concentration (as Chlorophyll)

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The purpose of my research is to develop a numerical box model that can be used to calculate the concentration of algae (as chlorophyll) in a well-mixed, closed water body system. This method calculated the algae concentration based on the its growth rate and death rate which are temperature-dependent terms. Knowing the initial concentration provided from field measurement and the net growth rate, the concentration of algae at certain time intervals can be obtained. Three primary growth factors: light intensity, water temperature, and nutrients concentrations were taken into account in the model. The effects of sediment concentration and water depth on the algae growth were also considered. This model was calibrated and validated using measured data in Lake Vechten, Netherlands and Beasley Lake in the Mississippi Delta. Acceptable accuracy was generally obtained using the developed model. Some scenario studies were conducted using this model to analyze the effects of global warming (increase in temperature) and the influx of nutrients on the algae concentration. It was shown that global warming decreased the concentration of algae while an influx of nutrients increased the concentration. An online interface has been developed using Flask, a Python web micro framework, and SQ-Lite, a lightweight database, to apply this model. This web-based model provides a user-friendly interface for model implementation and allows more users to access it.

Awards Won:

Fourth Award of $500