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Phytoplankton competition for nutrients and light in a stratified lake: a mathematical model connecting epilimnion & hypolimnion

In this talk, I will present several mathematical models describing the vertical distribution of phytoplankton in the water column. In particular, I will introduce a new mathematical model connecting epilimnion and hypolimnion to describe the growth of phytoplankton limited by nutrients and light in a stratified lake. Stratification separates the lake with a horizontal plane called thermocline into two zones: epilimnion and hypolimnion. The epilimnion is the upper zone which is warm (lighter) and well-mixed, and the hypolimnion is the bottom colder zone which is usually dark and relatively undisturbed. The growth of phytoplankton in the water column depends on two essential resources: nutrients and light. The critical thresholds for the settling speed of phytoplankton cells in the thermocline and the loss rate of phytoplankton are established, which determine the survival or extirpation of phytoplankton in epilimnion and hypolimnion. This is joint work with Jimin Zhang (Heilongjiang University), Junping Shi (William & Mary) and Hao Wang (University of Alberta).