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DYNAMICS OF STOICHIOMETRIC BACTERIA-ALGAE INTERACTION IN EPILIMNION. Preliminary report.

Bacteria-algae interaction in epilimnion is modeled with explicit consideration of carbon (energy) and phosphorus (nutrient). Global qualitative analysis and bifurcation diagrams of this model are presented. It is shown that there are three dynamical scenarios determined by the basic reproductive numbers of bacteria and algae. Effects of key environmental conditions are examined through these scenarios and from systematic and extensive simulations. It is also shown that excessive sunlight will destroy bacterial communities. Bifurcation diagrams for depth of epilimnion mimic the profile of Lake Biwa, Japan. Competition of bacterial strains are modeled to examine Nishimura's hypothesis that in severely P-limited environments such as Lake Biwa, P limitation exerts more severe constraints on the growth of bacterial groups with higher nucleic acid (HNA) contents, which allows low nucleic acid (LNA) bacteria to be competitive. (Received August 06, 2006)