



Feedback mechanisms between cyanobacteria and their environment - insights from numerical experiment

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While we have a rough understanding about the influence of physical processes on biological variables, our knowledge about biological-physical feedback loops in marine ecosystems is scarce. In this model study the impact of cyanobacteria on their environment and life cycle stages is assessed by a coupled biological-physical model. Several positive and negative feedback loops are identified including a short temperature-cyanobacteria-temperature loop which is embedded into longer ones running on the seasonal time scale. The short positive feedback loop leads to an increase of cyanobacteria and a simultaneous decrease of eukaryotic phytoplankton biomass in summer. However, the induced changes in the nutrient and temperature field result in an enhanced eukaryotic phytoplankton growth in autumn which degrade the winter light conditions for the resting spores of cyanobacteria. Nevertheless, the positive feedback prevails and overall cyanobacteria gain from their own presence. This study emphasizes the importance to consider species and life cycle characteristics in studies dealing with feedback mechanisms.