Abstract

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Title

Impact Of Nutrient Loads On The Fluorescence Signature Of Key Cyanobacterial And Harmful Algae

Description

Environmental perturbations such as global warming, light variations, and nutrient enrichment strongly affect cyanobacterial growth in freshwater and marine ecosystems. Among these, excessive inputs of inorganic nutrients into natural aquatic ecosystems play a leading role in the overgrowth of phytoplankton, death of aquatic organisms, and deterioration of surface water quality. This challenges the performance of water treatment processes due to the variable nature of algal blooms and their associated algal organic matter (AOM) characteristics. Early warning systems such as fluorometers are key to effective bloom management for the implementation of timely risk management strategies. Understanding the change in pigment concentration and AOM character is important when applying fluorescence for cyanobacterial and algal monitoring under variable seasonal and environmental impacts. Therefore, this study was carried out to investigate the effect of varying nutrient load (Nitrogen: Phosphorous) on the pigment concentration and AOM character of key bloom-forming cyanobacterial and algal species. The cell growth, fluorescence EEMs measurement, and nutrient analysis were carried out throughout the growth phase of the species. For the characterisation of cell pigments and AOM signature under variable nutrient load, five common PARAFAC components were identified to be useful. The DOC released at different N:P ratios was predominantly protein-rich in character. Under environmental stress conditions, algal and cyanobacterial cells showed low pigment content within the cells and contributed to the high release of organic matter dominant with protein-rich materials consisting of tryptophan and tyrosine-like substances. In addition, differences among the responses of the species for pigment and AOM character was evident. It also demonstrated that nutrients not only affect the cell density but also the character and concentration of DOC. This could help water quality managers to better understand the impacts of nutrient loads on surface water quality. Thus, the research outcomes have the potential to improve the robustness of algal bloom monitoring, eventually saving valuable time and operation costs.