IMOTOX

Identification and Monitoring of Toxic Cyanobacteria

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Summary

Blooms of harmful cyanobacteria have been shown to increase in both frequency and severity due to global warming, particularly through increased nutrient loads at extreme weather events with elevated winter/spring rainfall and flushing events followed by extended periods of summer drought. These blooms threaten our shrinking freshwater resources in several ways: By increasing turbidity and consequently depriving submerged plants of light they suppress invertebrate and fish habitats and can thus affect biodiversity. On the other hand, release of cyanotoxins during blooms can cause problems for fisheries, drinking water reservoirs as well as recreational water activities. This project aims to develop a monitoring and early warning system for cyanobacterial blooms, and study factors that influence bloom formation, toxicity and collapse. This will be achieved through a close interaction of molecular microbiology, analytical chemistry and remote sensing technology. The early detection of the rise of potentially harmful cyanobacteria in freshwater lakes will be achieved by remote sensing, followed by a targeted molecular, microbial and chemical verification which in turn will allow time for taking appropriate counter measures.

Aims

- Define the role of bacteriophage and protozoa in formation, toxicity and collapse of harmful algal blooms
- Modelling the optical properties of cyanobacteria
- Development of high-throughput screening assays for cyanotoxin measurements
- Monitoring of water quality using an octocopter
- Remote sensing of cyanobacteria in lakes

High throughput screening for cyanotoxins

Model the variability of optical properties

Prepare octocopter for monitoring of lakes

Harmful Algal Blooms

Anabaena sp.
Aphanizomenon flos-aquae
Microcystis aeruginosa
Planktothrix rubescens

Anatoxin
Saxitoxin
Microcystin

Anatoxin
Saxitoxin
Microcystin

Anatoxin
Saxitoxin
Microcystin

Anatoxin
Saxitoxin
Microcystin

Aplysiatoxin

Cyanobacteria from satellite

Baltic Sea, 2010-07-11
Truecolor image, MERIS RR

Cyanobacteria concentration
2 bloom centres


Courtesy S. Ribe (unpublished results)

Model the variability of optical properties

Effect of protozoa and bacteriophage on cyanobacteria

Healthy culture lysed by phage
Healthy culture lysed by protozoa

Goal: Cheap system operated by the end user

Dependency of absorption on pigment composition and growth conditions (light, nutrients)


High throughput screening for cyanotoxins

ELISA

Prepare octocopter for monitoring of lakes

Goal: Cheap system operated by the end user