VIEW ABSTRACT

MODERATE EFFECT OF ALLOCHTHONOUS ORGANIC CARBON INPUT ON GAS DYNAMICS IN A WELL-BUFFERED MESOTROPHIC LAKE

Inland waters are important sources of CO2 to the atmosphere due to outgassing of imported dissolved inorganic carbon (DIC) as well as mineralization of imported organic carbon (C). However in eutrophic lakes these sources may be outweighed by fixation of CO2 by primary production (PP), making them net CO2 sinks. Allochthonous dissolved organic carbon (DOC) input have increased in many inland waters and the effect of enhanced DOC are two-fold. Firstly, allochthonous DOC is a C source stimulating CO2 production. Secondly, due to its color, DOC attenuates light which suppress C fixation by primary producers. Here we used two crossed full factorial design mesocosms in the mesotrophic well-buffered Lake Erken, Sweden to test the effect of allochthonous DOC input and shading on gas dynamics in mesotrophic lake water. We found that DOC from two sources (a reverse osmosis concentrate from a headwater humic stream and HuminFeed®, a Leonardite extract) as well as shading promoted CO2 production. Although the DOC enrichments stimulated heterotrophic processes, we find that the regulatory effects of DOC on PP via shading dominated the DOC effect on DIC. Furthermore, alkaline (pH ~8.3) lake water resulted in the DIC pool largely buffering variations in CO2 from metabolism of allochthonous DOC. Despite substantial input of allochthonous DOC (5-10 mg/L) and subsequent mineralization, the relative effect on the C balance was moderate. Regardless of future increase in allochthonous DOC, we expect the C balance of eutrophic lakes to continue to be driven mainly by autochthonous PP dynamics.

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DETAILS

Oral presentation

Session #:095
Date: 03/01/2017
Time: 17:00
Location: 323 C

Presentation is given by student: Yes