

Interactive comment on “Forcing mechanisms behind variations in total organic carbon (TOC) concentration of lake waters during the past eight centuries – palaeolimnological evidence from southern Sweden” by P. Bragée et al.

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Author Comments to Referee #1

Title

We agree that it is a good idea to change the title, and we will work on a shorter and clearer alternative.

Introduction

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We will clarify the relationship between DOC and POC in the introduction.

Methods

We used gamma spectrometry for determination of the activities of ^{210}Pb , ^{137}Cs and ^{226}Ra . For calculation of sediment ages we used the constant rate of supply (CRS) model. This is already published material (Bragée et al, 2013) and we decided not to describe the methods in detail but we can of course add this information.

ZRAX is a refractive index mounting medium for diatom slides. ZRAX is a product name and it is not short for anything, but we will rephrase to “using the ZRAX mounting medium (refractive index = 1.7+)”.

The pollen assemblage from a large site/lake represents the regional (background) pollen loading while pollen assemblages from smaller sites represent pollen from both regional and local sources. To model the local vegetation using the LRA we need to know the regional background pollen loading (50-100 km radius) which is obtained using the LRA REVEALS (Regional Estimates of Vegetation Abundance from Large Sites) model. Pollen counts from the third lake (Fiolen) were used as a complement to obtain the regional pollen loading, using the REVEALS model. This was used for input to the LRA LOVE (Local Estimates of Vegetation) model to estimate the local vegetation around our two study lakes. The method is further described in Fredh et al. (2013) and Mazier et al. (2014). We will rephrase to “. . .from the larger, nearby Lake Fiolen to provide the regional pollen loading needed for the LRA approach (Fredh et al., 2013).”

Discussion

P 19980 L21-22, P 19983 L23 These sections in the discussion will be rephrased for clarification.

A new figure showing the correlation between TOC and SO_4 would certainly convey the main message. We will add such a figure.

The role of forestry practices such as clear-cutting and ditching for TOC mobilization

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have been debated among stakeholders in Sweden and the long-term problems have also sometimes been explained by these practices. We therefore considered this to be important although, or just because, the TOC mobilization most likely is a short-term effect.

Brownification is an established term for browning of lake and stream waters. (See for example Granéli, 2012)

The P/B abbreviation is explained in the methods section but can of course be repeated here.

P19987 L24-P19988 L19. The basic assumption is that a large number of surface sediment samples from a large number of lakes and contemporary lake water TOC samples can be used to teach the multivariate statistical model the relationship between sediment composition as measured by VNIRS and ambient lake water TOC content. For example a high-TOC lake influenced by mires does receive different types and quantities of organic carbon (both DOC and POC) as compared to a lake situated in an area dominated by agriculture or pine heaths. It is correct that only the POC part enters the sediment but both the POC and DOC parts are usually affected, both in terms of quantity and quality depending on catchment and lake characteristics. So when the lake water carbon content is dominated by DOC the correlation between TOC content and VNIRS is indirect. But lakes with very high DOC/POC ratios form the vast majority of the calibration data set. This means that the calibration model should perform as well for our presented lakes as in several previous publications.

It is correct that the inferred records of TOC content, pH and P/B diatom ratios are affected by uncertainties, and small changes may not always allow for identification of relationships. It is known that DOC content is not always correlated with water colour, and our data indicate that some of the past variations in inferred TOC content may not have been associated with changes in water colour. We will rephrase this section and clarify that there are uncertainties, although we consider also some of the second-order

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trends and shifts as interesting enough for reasoning.

P19989 L5-6 We agree that this can be stated more clearly in the abstract.

Interactive comment on Biogeosciences Discuss., 10, 19969, 2013.

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