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Biogeosciences Discussions

Interactive comment on "Stable carbon isotope as a proxy for the change of phytoplankton community structure in cascade reservoirs from Wujiang River, China" *by* B. Wang et al.

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Reply to anonymous referee 2

Response to major comments:

(1) Whether the δ13C of plankton collected by a 64-μm net tow can stand for the δ13C of phytoplankton is a key point in this study. The 64-μm net tow has been chosen according to Regulation for Water Envionmental Monitoring (P32, Professional Standard of the People's Republic of China, SL219-98). The material collected by 64-μm net tow comprised of major phytoplankton and some zooplankton, according to the results of observation of microscope, in this study. In pelagic food web δ13C levels of consumers

were close to those of pelagic phytoplankton (Yoshii et al. 1999). The study for lake Superior demonstrated that the δ13C values of phytoplankton collected by 53-163 μm tow have no significant difference from those of phytoplankton collected by <53 μm tow (Keough et al. 1998). Hessen et al. (2003) discovered that total seston apparently carries the stoichiometric and biochemical footprints from the phytoplankton and a major fraction of detritus is derived from autotrophs in 109 temperate lakes. So, δ13C of plankton collected by a 64-μm net tow can be used as a proxy of δ13C of phytoplankton (e.g. Bade et al. 2006) although there was some zooplankton in the material collected by 64-μm net tow.

(2) POC was the total carbon of particulate organic matter and surely contained the PPC fractions. So, the 0.65 um (GF/F filtered) fraction has not been pre-filtered with a 64um mesh. We did not determine their respective concentrations because they were not related to the purpose of this study.

(3) There are some methods to determine algal δ13C in freshwater (Marty and Planas, 2008). In this study we directly measured the algal δ13C and did not use the model to calculate. So, we did not present the concentrations of DIC, POC, and PPC. The main purpose of this study concerns the relationship between the algal δ13C and the change of phytoplankton community structure, and we thus did not discuss "if primary production can indeed explain the patterns in DIC-13C or whether atmospheric exchange and carbonate dissolution are significant contributors as well".

(4) Vuorio et al (2006) have investigated the taxon-specific variation in the stable isotopic signatures (δ13C and δ15N) of lake phytoplankton and their study was consistent with our study. Boschker et al. (2005) and Van den Meersche et al. (2009) found discrimination in estuarine diatoms to be smaller than in green algae. However, estuarine condition is different from the lake and reservoir environment. Boschker et al. (2005) used biomakers in their study. The carbon signatures of specific compounds are often variable for a given algal group, and the results are currently limited because of low data availability and poor knowledge of processes influencing the δ13C of specific

biomarker molecules (Pond et al. 2006).

(5) There was no relationship not only between εp and pCO2 (Bade et al. 2006) but also between the δ13CPOC and pCO2 (Gu et al. 2010, 2011). So, it is cautious to use the existing models to infer atmospheric CO2 levels.

Response to minor comments:

(1) 833(26) Higher trophic state was based on nutrient concentrations in this study.

(2) 833(29) "the downriver reservoirs... exhibit..." .

(3) 834(19) It has a discharge of 53.4 billion m3.

(4) 835(4) Titration of bicarbonate is a common chemical analysis technique. Bicarbonate was titrated with HCl on the spot in this study.

(5) 835(23) Yes. Phytoplankton was counted and determined with a standard light microscope.

(6) 835(24): The wet weight of phytoplankton was calculated according to its volume and density (Zhang and Huang, 1991).

(7) 836(22): Water temperature, dissolved oxygen, and pH were measured in situ using a calibrated water quality probe (model YSI 6600). Data support "pH and oxygen levels are explained by biological processes (photosynthesis)".

(8) 838(8): Yes, "DIC and POC are the main carbon species". We also measured dissolved organic carbon (DOC) concentration. However, it was not present in this study.

(9) 838(15): This question was clearly stated in the article.

(10) 838(24): "Previous study indicated δ13CDIC in various reservoirs is significantly different from that in natural rivers, but is close to that in natural lakes (Yu et al., 2008b)."

(11) Bicarbonate is expressed in mg L-1. These are mg of ions.

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