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Biogeosciences Discussions

Interactive comment on "Paleovegetation reconstruction using δ^{13}C of Soil Organic Matter" *by* G. Wang et al.

Anonymous Referee #1

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Topics:
This article aims to address the reconstruction of paleovegetation based on d13C of soil organic matter. Based on modern data collection, authors revisit previous models of paleovegetation reconstruction. They also propose a new one.

General comments:
This paper is of great interest since it questions the quality of paleovegetation reconstruction. They present the subject in a general scientific context with more and more published isotopic studies and reconstruction attempts.
I acknowledge the quality of data they obtained on a wide range of plants. Likewise I greatly appreciate to find most of the key points to consider before any reconstruction from stable isotope analysis. Nevertheless they omit major points (climate, altitude

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variation, pedogenesis pattern and vegetation temporal dynamics). This weakens their demonstration. Likewise they do not provide any error estimation that undoubtedly gives very large uncertainties within any potential paleoclimatic reconstruction. Because of this, the model they propose here is not better nor worst than those already proposed in the literature. They did not found the Holy Grail!

With a philosophical change within discussion and conclusion, i.e. announce a new method but not argue that everything previously done is bad, this paper could be published.

Details: Titre: OK

Abstract:OK

Introduction:
o Some of relevant points for organic geochemistry mentioned here have already highlighted been highlighted by Hatté and coworkers. One proof might be the 0.02per-mil/100ppm derived from Feng and Epstein (1995) that was not published in this way in the original study, but calculated for the first time by and in Hatté et al. (2001-QR), re-used by Liu et al. (2005) and independently by Hatté and Guiot (2005-Climate Dynamics). Please refer to this team (in your very long list of available studies).
o Likewise I'd greatly appreciate to read at least one reference to recent investigations based on specific compounds, as example Xie et al. (2003-QR).

4.2 Variations in d13C and carbon contents of soil organic matter
o p. 1806, l. 12: what do you call "top soil" and what is "bottom soil"? do you mean the upper 5cm or upper 10cm for the "top soil"? But what about the "bottom soil"?
o p. 1806, l. 12 "(1 s.e., n=14)": how can you have 14 measurements? You have 6 profiles, one measurement for the top + one measurement for the bottom would result in 12 measurements. Where do the 2 others measurements come from?

BGD
5, S778–S781, 2008

4.3 Reconstructions of paleovegetation

o authors argue that the extensive investigation they performed on the present vegetation is representative of the vegetation that grew during Holocene and Last Glacial: no change within C3 pool nor within C4 pool. They consider that there is no vegetation dynamics to replace a biome by another. This is obviously false. And if authors wish to go ahead with this assumption in their model, they must assess the inferred error. With a range of 8.3permil (from -21.7permil to -30permil) noticed for C3 plants and of 5.8permil (from -10.0permil to -15.8permil) for C4 plants, poles representative of C3 and of C4 are only very weakly defined. Secondly, authors consider that the isotopic shift induced by soil decomposition during Last Glacial is identical as during Holocene. This means that authors believe that Glacial soil has a pattern of decomposition identical similar than during Holocene. They are plenty of influencing factors that are radically different between Holocene and Glacial times: bacterial community and efficiency, precipitation, vegetation and therefore available biopolymers, and so on. This assumption is obviously wrong.

o You are assuming that isotopic responses of imprinting forcing can be summed. We all have no other choice than assuming the same way, but please specify that you effectively make this assumption.

o p. 1807, l. 18: authors refer to Yanan city as the reference point for precipitation level. How close is the studied location (Jiaodao) to Yanan City? Are they both at the same altitude? Same exposure to predominant winds? Which uncertainty might this induce? All of that might greatly differentiate both sites.

o P. 1808, l. 10-20: be aware that comparison between tree-ring d13C and vegetation bulk OM d13C is not direct. Indeed, I might assume (this should be specified) that for tree-rings you worked on cellulose or hemicellulose. Working on specific compounds allows to get rid of most of diagenesis risks, but give a restricted view of external forcing impact. Indeed, external forcing results in both changes in isotopic composition of individual components and in changes in relative ratios of components. The bulk OM isotopic signature integrates both parts of response, specific compound d13C reflects

BGD

5, S778–S781, 2008

only the first part of the response. So that you might not obtain the same result with cellulose than with bulk. You're further working with bulk (Vidic and Montanez's study), keep Feng and Epstein (1995) value and do not mention your other study.
o P. 1810, l. 8-9: based on error propagation, I'm almost sure that 34

Conclusion:
P. 1812, l. 8-13: as expressed before, I strongly disagree with that.

Bibliography:

Figures:
o Figure 2: why do some points have associated uncertainties and some not? Figure 3: keep the same order and same symbols between both panels. Add color, at least for electronic version, this would greatly help the reader to understand your figure. Where did you plot plant values? Add a focus for the upper 40 or 50cm.

Interactive comment on Biogeosciences Discuss., 5, 1795, 2008.