



EGUsphere, author comment AC1
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Reply on RC1

Deming Yang and Gabriel J. Bowen

Author comment on "Integrating plant wax abundance and isotopes for paleo-vegetation and paleoclimate reconstructions: a multi-source mixing model using a Bayesian framework" by Deming Yang and Gabriel J. Bowen, EGU sphere,
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We thank the reviewer for taking the time to review our manuscript, and the constructive suggestions. The reviewer suggested that we should elaborate on three aspects of the manuscript. Below is our response to the reviewer's suggestions point by point.

1) To paper would benefit from a more thorough comparison to existing techniques (e.g., linear mixing-model approaches of Gao et al., 2011). You state that your results appear to provide alternative interpretations to the same n-alkane records – please elaborate!

In our case studies (CS1 and CS2), we did provide alternative interpretations to the published data. In CS1, we compared the conventional interpretation of aquatic plant input based on the P_{aq} index and our interpretation based on $\delta^{13}C$ and chain length distribution of three n-alkane chains. In CS2, we compared the interpretation of vegetation composition based on $\delta^{13}C$ of one n-alkane chain, and our interpretation based on $\delta^{13}C$ and chain length distribution of three n-alkane chains. Both case studies provided comparisons with existing interpretation techniques and we highlight where the new method's results are similar to those methods as well as where they provide alternative or more nuanced interpretations.

We can not provide a direct comparison with the approach by Gao et al. (2011), specifically, based on the case studies we currently include, because these datasets do not contain all the information required by Gao's method. As discussed in the next response, we do plan to add additional comparisons to established methods for vegetation reconstruction.

2) It is essential to validate this approach in a sediment core with independent vegetation reconstructions. I would take a look at the African records published by Sarah Feakins (e.g., Feakins 2013 P3) - these include n-alkane chain length distributions, n-alkane carbon isotopes and the % of shrub, graminoids and tree pollen. This seems an ideal site to test your approach. However, I am sure there are dozens of other suitable sites.

We agree that the approach would be much more convincing if the results are consistent with an independent vegetation reconstruction, e.g., by pollen analysis. We have done a literature search and identified data that will allow us to complete such a comparison. We are planning to include such a comparison in the supplementary document. We would like to note that the comparison won't be a true validation, because the two approaches are

associated with different potential biases such as pollen/n-alkane production and transportation. For this reason, some differences between the approaches are to be expected.

3) The authors state that their approach could be used to assess the interpretation of associated proxies such as n-alkane $\delta^2\text{H}$. This would be a great tool for organic geochemists and paleoclimatologists. However, the authors did not explore this any further. The authors should demonstrate - if they can, this paper will be far more valuable to the paleoclimate community.

We agree with the reviewer that adding information on how the approach can help to interpret associated n-alkane $\delta^2\text{H}$ will add tremendous value to the significance of the framework. Doing so would make the manuscript more aligned with the aims and scope of the journal. We are planning to add one more case study to demonstrate how our framework can be implemented. The case study will be based on n-alkane records in a marine core off the Zambezi River Mouth (Wang et al., 2013, GCA), which has $\delta^2\text{H}$, $\delta^{13}\text{C}$, and chain length distribution data on n-C₂₇, n-C₂₉, n-C₃₁, and n-C₃₃ chains. Please note that doing so will require further development of the existing model structure, and discussion of model outputs. Please allow us some time to implement the case study in the revision.