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Univerzita Karlova v Praze
Katarína Holcová
Albertov 6
128 43 Praha 2
Czech Republic

RE: External review of Petra Zahajská's Masters Thesis

Dear Dr. Holocová,

I have carefully read and reviewed Ms. Zahajská's Master Thesis as the external reviewer. Ms. Zahajská's thesis focuses on determining if fossil plants are correctly assigned to either salt marsh or mangrove type environments by using a careful analysis of the geologic context of the samples, the carbon isotopic composition of bulk organics and long-chain *n*-alkanes, and an analysis of the cuticle morphology. This is an exciting approach that nicely merges many subfields of geology to answer questions that are hard with just one approach. I was especially excited by the combination of modern measurements of related plants from the UK and the US Everglades to constrain the geologic results. These approaches are by far the strengths of the thesis.

In my evaluation of the thesis, I think there are a few points that could be clarified and improve. Thes specifically are:

- Equation 6 was used to calculate the $\delta^{13}C$ of atmospheric CO_2. This is a correct usage from the citation provided (Arens et al., 2000). Unfortunately, the methods by which Arens derived this are incorrect and they assumed that no other factors influence plant fractionation other than the $\delta^{13}C$ of atmospheric CO_2. This assumption has been proven incorrect and unfortunately has complicated many studies. This is acknowledged in the Discussion (pg. 76-77).

- It appears that Equation 7 (ε_{lipid}) may have been measured (Table 2 and 3; Section 5.5) rather than used to correct the *n*-alkane data for the fractionation that occurs during the biosynthesis of *n*-alkanes (measured relative to bulk tissue). Values for this are usually used from the modern and applied to the past. For this study, it would be plausible to use one value for all plants measured here.

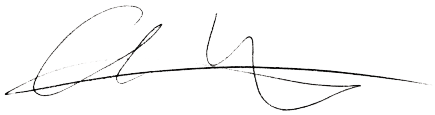
Rather than getting caught up on all of the complexities of predicting fractionation for the past and using to compare to, a much simpler method might be to just relatively compare the *n*-alkane $\delta^{13}C$ values among environments for both the modern and the past. This was done in in Section 5.6 and I agree with those interpretations. This approach could be utilized rather than trying to fix the Δ_{leaf} values, or I could

see an approach where the two are combined. Regardless, I agree that the geologic bulk $\delta^{13}C$ data measured here is not representative of much. Bulk $\delta^{13}C$ data from the geologic record can be influenced by so many factors, especially the source of carbon in these types of depositional environments where there is marine and terrestrial sourced carbon.

Despite the few points that I raise above, I think this is an exciting thesis that combines several techniques to address problems that are not often addressed because of the complexities in doing so. Apart from the research directions, I believe that the thesis is well organized and is nicely formatted. It was indicated that I should assign a grade to the thesis as part of the evaluation process. Based on the hard work done here, the complexities of the approach, and the novelty of the study, I would rate this as very good (2). With some addressing of the points I raise above, I think the score could be raised.

I wish the candidate the best of luck and thank you for asking me to evaluate the merits of the thesis.

Sincerely,



Aaron F. Diefendorf

c.c. Dr. Jiří Kvaček