

Biogeosciences Discuss., referee comment RC1  
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## Comment on bg-2022-57

Anonymous Referee #1

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Referee comment on "Carbon isotopic ratios of modern C3 and C4 vegetation on the Indian Peninsula and changes along the plant–soil–river continuum; implications for (paleo-)vegetation reconstructions" by Frédérique Kirkels et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-57-RC1>, 2022

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### General comments:

The authors have worked with a variety of samples viz. vegetation, soil, suspended particulate matter, riverbed sediments from the Godavari region which is commendable. But I am curious as to why the authors chose isotopic analyses for the study. The authors must note that there are other much stronger techniques that can be applied for palaeovegetation reconstruction, such as geochemical biomarkers or compound specific isotopic analyses of normal alkanes. These provide much more detailed/spot on information without significantly less biases or overlaps. So the authors must signify and explain very clearly the selling point of this paper and strength of the technique that has been used.

I would also like to add that unless a journal's terms and conditions require so, it is generally not a good idea to combine "results and discussion". Separating the two makes it much clearer as to what your own data and results are depicting and the discussion would include clear explanations of your results. It is important for readers to identify the original data of your research and separate them from previous literature data and knowledge that come under discussion part.

### Specific comments:

Page 6, Line 150-152: There is no mention in the introduction as to how microbial inputs or early diagenetic alterations and early decomposition of organic matter might affect the isotopic signatures. The present approach is highly one-dimensional primarily considering input of C3 vs. C4 vegetation in connection with wetter and drier conditions. Authors must

take into account all the other factors, particularly those which significantly influence isotopic fractionation.

Page 8, Line 190: "aboveground plant parts" - Is any part of a plant other than leaves being sampled?

Page 11: "Modern C3 and C4 plants in the Godavari basin and control by MAP" - Are there no CAM plants in the region?

Page 13, Line 306-308: "For C4 plants, the plants collected in the Godavari basin had significantly more negative  $\delta^{13}\text{C}$  values than the global average estimate ( $-14.0 \pm 0.2$  ‰,  $\pm$  standard error: SE) vs.  $-12.0$  ‰;  $p \leq 0.001$ ), revealing a difference between the local and global average C4 end-members" - Can you explain this observation?

Page 14, Line 317-318: Was the  $\delta^{13}\text{C}$  corrected for Suess effect?

Page 15, Line 334-335: "This difference suggests that the latter value, which is reportedly strongly biased towards dry ecosystems" - This is not clear.

Page 15, Line 336-337: "was significantly less negative in the upper basin ( $-28.0 \pm 0.3$  ‰,  $n=32$ ) than in the lower basin ( $-28.8 \pm 0.2$  ‰,  $n=45$ ;  $p \leq 0.05$ )" - Does this difference in the value qualify as "significantly" less?

Page 15, Line 337: "reflecting the gradient in MAP" - Is the difference enough to conclude a "gradient in MAP"?

Page 15, Line 342: "Pearson's  $R = -0.34$ " - This is not even significant especially for such a small population.

Page 15, Line 350-352: "Moreover, the Godavari C3 plants were not evenly distributed over the entire precipitation range. Together, this resulted in a relatively weak linear correlation with MAP for the individually measured C3 plants" - This contradicts the previous sentence on line 341. If the effect of MAP on isotopic values are significant, shouldn't the correlation be high?

Page 16, Line 384-386: "This isotopic contrast corresponds with the vegetation

distribution in the basin, with mixed C3 and C4 vegetation in the upper basin and more C3 plants in the lower basin" - Is the vegetational input only controlling factor for the isotopic values? What about any signatures of soil bacteria?

Page 18, Line 408-410: "However, C4-derived OC has also been shown to be preferentially incorporated into fine fractions where it is better protected against degradation, whereas C3-derived OC is preferentially added to the coarse fraction thus leaving it less protected" - What governs this affinity for the C4 plants towards finer fractions whereas C3 plants towards coarser fractions?