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Climate of the Past Discussions

Interactive comment on "Pliocene expansion of C_4 vegetation in the core monsoon zone on the Indian Peninsula" *by* Ann G. Dunlea et al.

Anonymous Referee #1

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Dunlea, Giosan and Huang use lipid plant wax biomarkers and their isotope composition to reconstruct the climate and vegetation of the eastern Indian peninsula over the last 6 million year. They find that C4 vegetation was already present in the late Miocene and further expanded during the Pliocene. They argue that this expansion was likely caused by changing precipitation patterns during the studied time period as well as a decline in atmospheric CO2 during the Pliocene. The results are consistent with previous reconstructions from the region that yielded similar results. The manuscript is overall well written. As outlined below there are however shortcomings regardingh the description of the methodology that should be addressed prior to its publication and several points where the authors should expand the manuscript and provide further information.

Major comments: The authors should consider moving the method description from the appendix to the main text to have it in chronological order. In the journal format of Climate of the Past there is no reason to put the methodology at the end.

Lines 82-85: As is, it is confusing to see sample pairs mentioned without proper explanation. I would suggest do give a detailed description of the core and the reasoning behind the sampling strategy beforehand to avoid any confusion.

In Fig. 2C and lines 113-115 it is mentioned that the dD values are corrected for physiological effects of C3 and C4 photosynthesis. Unfortunately, there is no description available of how this correction was conducted. This should be added in order to be able to reproduce the calculations and presented results.

In lines 147-153, the Pliocene C4 expansion is explained by a lowering in atmospheric CO2. It would be useful to show the CO2 and C4 vegetation trends together in a figure to illustrate this point.

In the description of the compound-specific isotope analysis it is mentioned that the fatty acids were methylated prior to analysis (i.e. a methyl group added). Since this methyl group changes the isotope composition of the resulting fatty acid methyl esters, the measurements need to be corrected using the isotope composition of the methanol used in the reaction. Without the proper correction the absolute values and associated interpretations are incorrect.

Minor comments: Line 27: Add some references backing up the sentence ending at the beginning of this line.

Line 47: Specify what kind of model was used in the cited study.

Lines 92-94: Why are the mid-Pliocene (3-5 Myr) and mid-Pleistocene (1.5 Myr) selected in this description. On the figure, the trend in dD seems to be pretty constant and the selection of these time points seems rather arbitrary.

Lines 113-114: This sentence on physiological effects of C3 versus C4 plants on dD

is not really connected to the previous sentence on airmass mixing. It is therefore confusing to see the word thus at the beginning of this sentence.

Line 182: The unit cm3 already implies volume. The word volume after the unit is therefore redundant and can be deleted.

Line 210: Provide the isotope composition of the methanol used.

Lines 225: Specify the standard used. Was it an industry standard with known isotope values? Figures: In the text the abbreviation for million years is Myr, while in the figures Ma is used. This should be homogenized.

In the method description, alkenone and alkane measurements are described which are however not mentioned in the rest of the manuscript. Of course, it would be interesting to see these results. So, the authors should either remove reference to these measurements or include them in the manuscripts.

Supplementary tables S1-S3: In order to facilitate the use of data by other scientists, consider moving the data contained in the tables to a separate file that is in a machine-readable format.

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