Comment on egusphere-2022-23
Anonymous Referee #1

Referee comment on "Vegetation reconstruction using plant wax n-alkane chain length distribution and δ¹³C of multiple chains: A multi-source mixing model using Bayesian framework" by Deming Yang and Gabriel Bowen, EGUsphere, https://doi.org/10.5194/egusphere-2022-23-RC1, 2022

In this paper, Yang and Bowen develop a Bayesian framework to help interpret sedimentary n-alkane distributions. The authors outline the Bayesian framework and apply this in two case studies. The authors also outline areas for future development. I have little expertise in Bayesian statistics and unable to comment on the model itself. I suspect the paper will be of interest to organic geochemists. However, the paleoclimate implications are not clear. In its current form, this would be more suitable for a specialised journal (e.g., Organic Geochemistry).

I have three major suggestions:

1) The 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!

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.

3) The authors state that their approach could be used to assess the interpretation of associated proxies such as n-alkane δ2H. This would be a great tool for organic geochemists and paleoclimatologists. However, the authors did not explore this any further. The authors should demonstrate how their approach can refine the interpretation of leaf wax del2H records - if they can, this paper will be far more valuable to the paleoclimate community.