

Clim. Past Discuss., community comment CC1  
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## Comment on cp-2022-26

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Community comment on "Effects of orbital forcing, greenhouse gases and ice sheets on Saharan greening in past and future multi-millennia" by Mateo Duque-Villegas et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2022-26-CC1>, 2022

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This paper discusses the simulation of the North Africa monsoon and vegetation in the last 190,000 years. In particular, it highlights that an increased GHG lowers the threshold for Africa Humid Period (AHP) in the vegetation coverage. The paper is interesting and should be published. But, the paper would be more interesting to readers if some points can be clarified before publication.

Major questions:

The first question is on the mechanism of this threshold change in the model. Why is the threshold reduced (instead of increased) at a higher CO<sub>2</sub>? Can some specific sensitivity experiment be performed to show this change of threshold is caused by some vegetation (model) property/threshold, changing at different levels of CO<sub>2</sub>?

The second question is on the role of vegetation feedback. Does this model has a positive vegetation feedback on precipitation in N. Africa? Or What is the role of vegetation feedback here? It seems to me in Fig.3 that the threshold is present only for vegetation, not for precipitation. If vegetation has a strong positive feedback on precipitation, I would also expect a threshold appearing on precipitation. Related to this, the forcing factor separation shows a big difference between precipitation and vegetation, with orbital forcing dominant on vegetation, but not on precipitation. It may be interesting to perform an experiment with the vegetation fixed to see how the precipitation changes. Even only one section of the simulations over 1-2 AHPs will be interesting.

Minor questions:

- The definition of monsoon index is confusing to me. It itself sounds like an index for the monsoon response, but, it is really the insolation forcing. Perhaps, it should be changed to Monsoon Forcing Index.
  
- Why EI interglacial has a negative GHG of  $-2.8 \text{ W/m}^2$ ? I thought interglacial has a higher  $\text{CO}_2$ ?
  
- 3: Caption needs to be more specific. What is a dot for? Correlation thorough the entire period, or AHPs?
  
- The title is on GHG lowers the threshold. But the paper discusses much beyond this, and actually, this point is somewhat lost in the discussion, at least, it does not read to me like the major point of the paper, because of so many other things discussed. Maybe this is indeed the most novel point, while other points are just consistency check...If that is the case, other parts can be simplified to highlight this novel point.