

Review of the paper entitled “Sporopollen evidence for Late Miocene stepwise aridification on the Northeastern Tibetan Plateau , submitted to *Climate of the Past*:

The manuscript analyses sporopollen records that indicate a two stage stepwise aridification of the study area (Tianshui Basin in the eastern Longzhong Basin) during the Late Miocene.

The study is thorough, well structured and well written.

Nevertheless one major point to be improved in my opinion is the discussion. Further down I'll add some suggestions to improve especially the quality of the last paragraph within the discussion section 5.2. The reasoning of the aridification in the area should be extended and some additional modelling studies (also some more recent ones) that investigate the effect of uplift in the Himalaya/Tibet area on Asian climate should be included in the discussion section. Further on the discussion of these studies and the ones already cited by the authors should be deepened.

I will not comment on the methods section, as I'm not an expert in sporopollen analysis. This is covered perfectly by the referee Lydie Dupont.

Discussion:

- 1) The effect of uplift on climate is regionally differing (e.g. Liu and Yin (2002) and also many of the other studies go into more detail with that). Kutzbach, Prell et al. (1993) also mention the regional response to a uniform Tibetan uplift and monsoon intensification (wetter to the south and east of Tibetan plateau, dryer to the north and west).
- 2) Additionally there is the hypothesis (and modelling studies exist) that show the importance of the drying of the Paratethys during the late Miocene for Asian monsoon development. This point should also be mentioned (Ramstein, Fluteau et al. 1997; Guo, Sun et al. 2008). Guo, Sun et al. (2008) mention also the effect of a spreading of the South China Sea.
- 3) It would be advantageous to confront also the different modelling studies and proxy records as far as possible (e.g. general intensification of monsoon, but regional effects on precipitation vary largely among the studies). For example the study of Tang, Micheels et al. (2011) indicates that with uplift only the EASM strengthens, whereas the EAWM weakens, which is at odds with proxy records of the publications you mention here)
- 4) Last but not least with the discussion of model experiments the large differences between the different studies should be mentioned (resolution, uplift scenarios, types of models – coupled or atmosphere only, RCM or GCM, differences in other boundary conditions that might influence the model response- e.g. Tortonian boundary conditions and forcing data in Tang, Micheels et al. (2011) etc.).
- 5) You might find the following publications also useful: (Kitoh 2004; Wu, Liu et al. 2009; Boos and Kuang 2010; Kitoh, Motoi et al. 2010; Zhang and Liu 2010; Wu, Liu et al. 2012; Wu, Liu et al. 2012; Boos and Kuang 2013; Chen, Liu et al. 2014)
- 6) Please also add some more detail on your discussion of the impact of global cooling on Asian climate evolution.

Minor comments

Abstract:

P5244, L12: "...more humid climate developed.." better: ... rather humid climate existed.." as it is not known from the data whether the climate was wetter or dryer before 11.4 Ma.

P5244, L16: "... Asian aridification ... " Maybe better write "Central Asian aridification" or aridification in the study area, as there is no proof for a general aridification trend all over Asia, this is to my knowledge e.g. the case for Central Asia, whereas in some regions even more humid conditions developed during that time period.

Introduction:

P5245, L 1+2: is modern Asian Social development relevant for the study? If not, please eliminate that sentence.

P5245, L 28+29: "... of northern China through and the evolution of the Asian Monsoon." this sentence is weird

P5246, 1st paragraph: please indicate a reason why you assume the Longzhong Basin to be the most promising for distinguishing TP uplift and any assoc. env. change.

Discussion:

P5255, L6: "...during toward..." - double wording?

Figure captions:

Figure 4: the labelling is mixed up:

what is g) in the figure is not included in the caption, whereas g) in the caption should be h) and h) should be i).

References:

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Guo, Z. T., B. Sun, et al. (2008). "A major reorganization of Asian climate by the early Miocene." *Climate of the Past* **4**(3): 153-174.

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Kitoh, A., T. Motoi, et al. (2010). "Climate modelling study on mountain uplift and Asian monsoon evolution." *Geological Society, London, Special Publications* **342**: 293-301.

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- Zhang, R. and X. D. Liu (2010). "The effects of tectonic uplift on the evolution of Asian summer monsoon climate since Pliocene." Chinese Journal of Geophysics-Chinese Edition **53**(12): 2817-2828.