

Reviewer (Junsheng Nie)

This paper is a follow-up paper of their Earth Science Reviews (ESR) paper. In the ESR paper, they didn't report data younger than 5-4 Ma, they did in this paper. I kind of like this paper, although as Dr. Mildenhall note, the paper needs some key improvements. First, English needs to be improved. Second, they don't have very good age model and detailed data information for the F2 core. For the second weakness, the authors have acknowledged it in the manuscript, so I think that this might not be a big issue. Alternatively, deleting the F2 core results may be another option? However, they address two key questions in paleoclimate research in central Asia: how did the late Cenozoic climate evolve in central Asia and what is/are its forcing mechanisms. Although the data presented in this paper have been published before, it seems that nobody has looked at these data together. This is the parts why I like this paper. I have some other suggestions for the authors, the editor, and the reviewers/readers to consider: First, this paper is not as well organized and presented as their ESR paper and they didn't give enough credits to their ESR paper. I suggest the authors use some words summarizing the findings of their ESR paper and then introduce why this work is necessary. Such words will put them work in broader context and make readers easier to understand. Second, as a review-type paper, I feel that they should compare results from both the western, central and eastern part of the Qaidam Basin, instead of just presenting data from the western Qaidam but citing the results from the central and eastern Qaidam. From their manuscript, I learnt that the western and eastern Qaidam Basin might have different climate evolution trends since the late Miocene.

This is quite interesting because this finding seems to support their main conclusion in the ESR paper, i.e., the climate trend since the late Miocene period on the Chinese Loess Plateau, and probably in eastern Qaidam, is different from that in the other parts of the Eurasian continent. This inconsistency is because existence or uplift of mountains which tends to intensify rainfall on the windward side, according to these authors. This also brings to a question for their figure 5. I guess their core sites are in the windward side in the figure, whereas in fact, the three sites should lie in the leeward side of the mountains shown in the figure. So they should revise the figure to correct this error if my understanding is correct. Also I feel that a contrasting cartoon demonstrating how rainfall from the eastern Qaidam and the Chinese Loess Plateau would change through time would be very useful. Such a cartoon would be able to help the authors to communicate their ideas better

with the readers. Third, as a review-type paper, there is no need to have a "Materials and methods" section. I suggest them organize this manuscript similar to their ESR paper.

Response: Thank you very much for your valuable suggestions. First, the new manuscript has been edited by GeoEditing (please see the first response to Dr. Mildenhall, if possible we will continue to improve it until it is up to the publication standard). Second, reference to Core F2 has now been deleted due to its poor age model and lack of detailed pollen data, and it is now only mentioned in ‘5.4 Aridification during 5-3.1 Ma’ (lines 382-386). Our ESR paper was finished before the SG-3 core pollen identification, so in that paper we only can focus on the Miocene and earliest Pliocene aridification and its mechanisms. After compiling the pollen data from the KC-1 and SG-3 cores together, we are excited that this is the first time that we can show such a clear aridification trend spanning the last 18 million years, which strongly supports our interpretation of the drying mechanism presented in the ESR paper. However, in that paper the discussion is not in-depth, and the Pleistocene climate pattern is not assessed. So, we are eager to show such long-term climate trends and to further discuss the driving forces. Hence, by applying CONISS, DCA, PCA and correlation analysis, as well as noting the positive water vapor capacity relationship with temperature, we are sure that the global cooling should have been the dominant factor in the western Qaidam Basin aridification. Additionally, by comparing with the past uplifts in and around the Qaidam Basin, as well as the eastern Qaidam Basin records, the Tibetan Plateau uplifts as and monsoon influence become clear. So, according to our renewed logic, Fig. 11 has been redrawn.