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Interactive comment on "Three main stages in the uplift of the Tibetan Plateau during the Cenozoic period and its possible effects on Asian aridification: A review" *by* Zhixiang Wang et al.

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1. Scientific significance: The authors do not provide new data, analysis, or concepts. The links between silicate weathering and CO2 drawdown have been with us for multiple decades. The discussion of links between tectonic events on the Tibetan Plateau and climate events cherry-picks events and muddles their timing.

In this study, we only summarized that the evidence of the age of the Tibetan Plateau, and the climatic variations of inland Asia. On this basis, we found that there are three distinct uplifts in the Tibetan Plateau. At the same time, the climate in Asia had a significant drying trend. Therefore, we proposed that the three main uplifts of the Tibetan

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Plateau significantly affect the Asian inland aridification. Therefore, this manuscript was not provided new data and analysis.

2. Major comments : The authors need to clearly delineate time periods of interest. For example, currently all middle–late Miocene climate changes are lumped together, even though the original authors discriminate different mechanisms for climate changes within this period. Similarly, the Cretaceous paleoelevation history of the plateau is largely ignored. See comment on line 400 for an example. Documented uplift events and paleoelevation are not clearly correlative to climate shifts. For example see comment on lines 537–542. Data and conclusions are apparently reported largely without context or comment. This may be fine for an annotated bibliography, but for a review paper, some context and analysis of claims is needed. Otherwise, readers might as well go read all of the citations for themselves. The lack of critical analysis of the data obviates the need for this review. See comments on lines 68 or 397 for an example. Alternative explanations for the observed climate change are dismissed out of hand, without presentation of counter-evidence.

We agree with the Reviewer suggestions. We have lumped together middle-late Miocene climate changes because numerous geological evidences show that the Tibetan Plateau has significant outward growth and uplifts of marginal mountains. In the original manuscript, we have emphasized the Cretaceous paleoelevation history (line 189-199). In the revised manuscript, we do not judge whether the results of the published papers are the right or wrong. We only summarized and concluded the evidence in the uplifts of the Tibetan Plateau and associated with climatic changes. Therefore, we do not comment, analyze and declare data and conclusions from the referenced articles.

3. Delete “the” before “Tibet” Line 16, 28, 517: Delete “the” before “uplift” Line 19, 26, 77, 277, 343: Replace “during” with “from” Line 20: Delete “n” in “Himalayan” Line 23: Delete “the” before “Eocene” Line 23–24: Delete “the” before “northern” Line 25: Delete “the” before “central” Line 39: The Cenozoic is an era.

Done

4. Line 57: Why “was interpreted”? Reconsider verb tense.

Corrected.

5. Line 66: Add “the” before “Lhasa” Line 68: What about the detrital zircon geochronology suggests that Indo- Asian collision occurred at that time? The authors need to provide sufficient detail for readers to evaluate the claims without having to read the cited literature in its entirety.

Corrected. The detrital zircon geochronology was used to constrain firmly the time when Asian-derived detritus was first deposited onto India. We have revised in the manuscript.

6. Line 69–72: This sentence does not make sense. Rewrite.

We have deleted.

7. Line 80: Replace “activities” with “activity”

Done

8. Line 82: Awkward. Rewrite.

Corrected

9. Line 83: No caps on “Paleomagnetic”

Corrected

10. Line 86: What paleomagnetic results? See comment on line 68.

We have interpreted in the manuscript. The paleomagnetic results are from 43 sites of late Cretaceous red beds, 32 sites of late Cretaceous lava flows, and nine sites of Eocene tuffs.

11.Line 94: Begin this sentence with, “The second is: : :.”

Done

12. Line 111: What “simulated” data? Line 115: Why “continued”? Is the plateau still being uplifted? Shortening simulation data and corrected it. We have deleted the “continued”.

13.Line 121–124: This is not accurate. In the models of Boos and Kuang, the Himalaya do not act as a heat pump, but rather act as a barrier which prevents cold and dry Asian air masses from penetrating southward into the Indian subcontinent.

We have not said act as a heat pump and suggested orographic insulation. We have added a word “respectively” in the revised manuscript.

14. Line 139: This whole line of argumentation ignores recent evidence for high elevations in southern Tibet by the Late Cretaceous (e.g., Ding et al., 2014).

We have emphasized and suggested in the original manuscript (line 189-199), and not ignored these results.

15. Line 143: Replace “by providing” with “due to”

Done 16. Line 152: References? Lines

Corrected.

17. 157–158: Basins and the Monsoon cannot have fossil leaf trait spectra. Rewrite.

This is the result from the article (Spicer et al., 2016, EPSL)

18. Line 180: Delete “second”

Done

19. Line 189: DeCelles et al. (2002) is not an appropriate reference here.

Deleted.

20. Line 195: van Hinsbergen et al. (2011) do not present any balanced crosssections.

Deleted.

21. Line 230: Change “offer a large amount for” to “would provide abundant”.

Done

22. Line 236: Delete “the” before “thermal”

Done

23. Line 237: The authors have not demonstrated that exhumation rates are correlated to surface uplift rates or absolute elevation.

Corrected.

24. Line 244, 349: Delete “s” on “uplifts” Line 247: Delete “sea”. Line 253–254: This sentence (particularly the second half of the sentence) is unclear. Rewrite.

Done

25. Line 278: Insert “the” before “modern”

Done

26. Line 345: Insert “the” before “late”

Done

27. Line 345: What does “which” refer to?

“which” refers to the retreat of the Paratethys Sea.

28. Line 360: This is an awkward sentence. Technically, the middle–late Miocene is part of a geological epoch, not “a fundamental change in earth’s (sic) climate system”.

Corrected

29. Line 365

Corrected

30. Line 397: This is a case in a general point that the authors need to provide more details for readers to be able to evaluate the claims. No mention is made of the depositional setting where this change in CO3 content was observed. Without these details, the reader is forced to find and read the relevant literature, obviating the need for this review.

Corrected.

31. Line 400: What time period are the authors referring to? Hough et al. (2014) observe a regional increase in aridity at _14 Ma, but a basin-specific increase in aridity at _ 10 Ma.

We suggested the age of 14-8 Ma interval. We have emphasized the manuscript.

32. Line. 537–542: The timing of the these climatic shifts in the early Cenozoic is not clearly correlative to paleoelevation of the Tibetan Plateau. The southern Tibetan Plateau was probably close to modern elevation in the Late Cretaceous. Why did the climate shift not start then? The only uplift/exhumation events that the authors identify in this timeframe are in the northernTibetan Plateau.

We agree with the opinion that the southern Tibetan Plateau obtained elevation close to modern, whereas the climate is relatively humid in the late Cretaceous. This is an interested problem. Recent models show that mountain uplifts in the northern margin of the Tibetan Plateau have caused significant reductions in annual precipitation in a broad region of inland Asia (Liu et al., 2015, QSR). Also, simulation results show that if we removed of the Tibetan Plateau, and only provided a narrow orography of the Himalayas and adjacent mountain ranges, the large-scale South Asian summer monsoon circulation is unaffected (Boos and Kuang, 2010, Nature). Therefore, we guess that the southern Tibet uplift has a limited effect on climatic changes in inland Asia. However, this is only guess, and needs further simulations.

33. Line 552–554: Again, if these regions were elevated by the Late Cretaceous, what is the driver for initiation of the monsoon in the early Cenozoic?

Simulation results show that initiation of the monsoon in the early Cenozoic was produced by insulating warm, moist air over continental India from the cold and dry extratropics via the high Himalayas and adjacent mountain ranges (Boos and Kuang, 2010, Nature), but this is need to further simulate in future.

34. Line 565: Seems ad hoc. CO2 draw-down is attributed to uplift-induced silicate weathering, but upticks in CO2 concentration are unrelated to formation of the Tibetan Plateau?

YES. We not suggest that upticks in CO2 content are related to Tibetan Plateau. We say that the upticks in CO2 content during late Oligocene are not related to the silicate weathering. 35. Line 581: The Tibetan Plateau is a big place. What parts of the Tibetan Plateau in specific are the authors talking about? The northern margins of the Tibetan Plateau. We have emphasized

Please also note the supplement to this comment:
https://www.clim-past-discuss.net/cp-2018-64/cp-2018-64-AC3-supplement.pdf

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