

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.

Anonymous Referee #2

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Scientific significance: 4 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.

Scientific quality: 3 See comments above.

Presentation quality: 3 Figures are generally acceptable. The English needs editing. I have highlighted some, but not all, of the problematic areas in the detailed comments below.

Major comments The authors need to clearly delineate time periods of interest. For
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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.

Detailed comments Line 15: 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. Line 57: Why “was interpreted”? Reconsider verb tense. 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. Line 69–72: This sentence does not make sense. Rewrite. Line 80: Replace “activities” with “activity” Line 82: Awkward. Rewrite. Line 83: No caps on “Paleomagnetic” Line 86: What paleomagnetic results? See comment on line 68. Line 94: Begin this sentence with, “The second is...” Line 111: What “simulated” data? Line 115: Why “continued”? Is the plateau still being uplifted? 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. 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). Line 143: Replace “by providing” with “due to” Line 152: References? Lines 157–158: Basins and the Monsoon cannot have fossil leaf trait spectra. Rewrite. Line 180: Delete “second” Line 189: DeCelles et al. (2002) is not an appropriate reference here. Line 195: van Hinsbergen et al. (2011) do not present any balanced cross-sections. Line 230: Change “offer a large amount for” to “would provide abundant”. Line 236: Delete “the” before “thermal” Line 237: The authors have not demonstrated that exhumation rates are correlated to surface uplift rates or absolute elevation. 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. Line 278: Insert “the” before “modern” Line 345: Insert “the” before “late” Line 345: What does “which” refer to? 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”. Line 365: Awkward. Rewrite. 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. 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. Line 537–542: The timing of 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 northern Tibetan Plateau. 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? 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? Line 581: The Tibetan Plateau is a big place. What parts of the Tibetan Plateau in specific are the authors talking about?

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