

Interactive comment on “Neogene tectonics and climate forcing of carnivora dispersals between Asia and North America” by H. Jiang et al.

Anonymous Referee #1

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General comment

(First of all, I would like to state that I am a paleoclimate/paleo-environnement modeller, and I think my opinion on this paper should be confirmed by a geochemist or a paleontologist.)

I have carefully read the paper but it leaves me with the global feeling that it is void of any conclusions and totally misses the point it claims to prove. I have the feeling that the authors have fallen into circular reasoning, without showing any mechanism proving their hypothesis (that tectonic changes or climate are the cause for carnivoran migrations) nor mentioning the other hypotheses.

The paper does not provides any mechanism linking tectonic changes to carnivoran

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migrations. However, the paper does provide a review of some tectonic changes occurring in the Tibetan plateau, and global cooling roughly coinciding in time with the major carnivoran migrations. The reviewed tectonic changes and global cooling could be one hypothesis for each migration wave of carnivorans, but nothing in the paper allows to infer the validity or invalidity of this hypothesis. Are there other hypothesis ? If yes, they are not mentioned.

Moreover, it is not explained how these potential tectonic movements or cooling events would impact carnivorans. I would have expected that carnivorans, such as other living animals, migrate because of a decreased resource/habitat availability, so because of climate changes destroying their habitat and/or predator/prey availability changes. These aspects are not mentioned here.

Moreover, the differences between the different migration waves, and notably the differences between the different species are not discussed. I am not competent on this aspect since I am a climate modeller. However, many questions can be raised : what are the differences between the species of the first wave at 20 Ma, and of the second wave at 8 Ma ? Why were other species migrating the other way around ? What was the distribution of each group of species in Eurasia before each migration wave ?

Apart from reviewing tectonic changes and global cooling occurring at different periods, the only explanations the authors give to prove their hypothesis are : 1/ page 2450: "With such widespread deformation recorded, there also is a large impact on the faunal changes in Asia." This is what I call circular reasoning. The authors assume that tectonic changes impact carnivoran migrations. Because they find evidence for tectonic changes, then they have some impact on faunal migrations ! Let's assume that tectonic changes do have an impact of faunas. Why would they migrate towards North America ? Why would they not simply go away from the Tibetan Plateau but stay in Eurasia, which is quite a vast area ? Why would they not simply reduce in number, as a result of increased pressure on available preys ? This is not discussed here. It is thus not possible to call this section "Carnivoran dispersal from Eurasia to North America

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at ~120 Ma probably caused by tectonic movements". Coincidence does not mean causality.

2/ page 2451-2452 : "The results indicated that compiled moisture proxy data from the four regions surrounding Central Asia co-varied and correlated with each other (Miao et al., 2012), supporting the inference that global cooling provided a dominant driving factor for the drying of Eurasia (Jiang et al., 2008; Lu et al., 2010; Lu and Guo, 2014). Accordingly, global cooling is believed to have been responsible for the mammal exchanges between North America and Eurasia during 13–11 Ma." Because they find evidence for global cooling, then they state it is the cause ("has driven") of the carnivoran exchange. How does global cooling impact carnivoran faunas ? This is not discussed. Why would they go back and forth ? If Bering Strait is closed, as it should be before the very end of the Miocene, carnivorans do not need sea-level drop due to increased land-ice (driven by global cooling) to go back and forth between North America and Eurasia. How does global cooling allows it then ? It is not discussed. Once again, it is thus not possible to call this section "Mammal exchanges between Eurasia and North America during 13–11 Ma possibly driven by global cooling".

3/ page 2454 : "Therefore, significant environmental events characterized by widespread dust accumulation occurred at 7–8 Ma in North China and the western Pacific (e.g. Ding et al., 1998b; Rea et al., 1998; Sun et al., 1998; Pettke et al., 2000; Guo et al., 2001; Qiang et al., 2001). Such events are responsible for the carnivoran dispersal from Eurasia to North America at 8–7 Ma, probably driven by a combination of continuous global cooling and tectonic movements of the eastern and northeastern Tibetan Plateau." It is again not explained how these events "are responsible for the carnivoran dispersal"...

4/ page 2456-2457 : Here, the authors are more nuanced, but still do not explain us how the cooling should lead to the carnivoran exchange : "Therefore, the closure of the CAS during 4.8–4.0 Ma and its influence on ocean circulation was possibly the major forcing factor for global cooling since 4 Ma, which should be responsible for carnivoran

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exchanges between Eurasia and North America at 4 Ma."

Conclusions : The conclusions are based on the above sentences. I do not think that the authors have demonstrated any of the conclusions they write. This paper is only a review of chosen, not exhaustive tectonic and climatic events. It might be that their conclusions are correct, but we have no way to assess it in this paper.

Specific comments :

Figures 1, 2, 6 These figures are not informative. It would be more informative to show the distribution of carnivorans in Eurasia and North America before and after each migration event, even if the picture is incomplete because of taphonomy, conservation and sampling biases.

Figure 5 This is not, as stated, a "correlation". These are simply two curves one below the other. The first curve is the Zachos oxygen isotope curve. The second curve is the sea-level curve from Haq. These two curves necessarily look similar because they are redundant, since the oxygen isotope signal of benthic foraminifera (Zachos curve) is imprinted by changes in sea-level. This figure demonstrates that the authors do not understand the proxies they are using here.

I suggest the authors carefully reconsider their paper. They must at least give more information on the distribution of the carnivoran before and after each migration, give more information on the different species in order to be able to assess their ecological niche. This will allow the authors to understand how the mechanisms they propose have changed the environment, and thus the carnivorans ecological niche. This will help them provide mechanisms allowing to give credit to the hypothesis they propose, and allow them to write a robust paper.