The authors of *Ancient tropical extinctions contributed to the latitudinal diversity gradient* present an intriguing paper that takes a historical approach to examine one of the most prominent macroecological pattern on Earth – the latitudinal diversity gradient (LDG). They briefly review the various hypotheses proposed to explain the general decline in species richness from equatorial to polar regions, and introduce a new frame-work, the asymmetric gradient of extinction, that ties together previous LDG theories and attempts to rectify theory with the observation that the steepness of the LDG varies considerably over geological time. The authors should be commended for bringing together diverse data sources and analyses to support their theory, and this paper represents a major advancement in the study of the LDG.

I have only one major suggestion on how this manuscript could be improved.

The crux of their argument is that during 'greenhouse' periods, tropical-adapted lineages have the opportunity to expand and establish into Holarctic regions – resulting in a shallow LDG as diversity accumulates through dispersal and in situ speciation. During the transition from 'greenhouse' to 'coldhouse' global climate eras, there should be a disproportionate loss of tropical-adapted lineages from the Holarctic, creating a steep LDG. This is an intuitive and intriguing idea, however I feel that the key test of this hypothesis has not been shown – that lineages *originating* in the tropics, but *present* in the Holarctic should have much higher extinction rates than 1) lineages with Holarctic origins and 2) tropical/Holarctic lineages in the equator.

While they do demonstrate what appear to be broad-scale differences in extinction and origination for Holarctic vs. Equatorial species across this transitional period – what would really solidify their hypothesis would be to test the following predictions using this same dataset:

1. Species from ancestrally tropical lineages have higher extinction (and lower or equal origination) in the Holarctic than species from Holarctic-derived lineages during coldhouse/transitional periods
2. Species from ancestrally tropical or Holarctic lineages have equivalent origination and extinction rates in the equator during this period

It may be difficult to assign 'Holarctic' vs 'Tropical' origin to all species, but presumably the DEC analysis could potentially be used to categorize lineages as Equatorial or Holarctic origin. Alternatively one might expect that species from lineages that have longer evolutionary histories in the Holarctic would have lower extinction rates during the transitional and coldhouse periods. There are a few methods that may work to assign origin in this case. The authors could then repeat their analyses (Fig. 6) with rates estimated for these four groupings (Tropical in Holarctic; Temperate in Holarctic; Tropical in Equator; Temperate in Equator), this would significantly strengthen the narrative of the manuscript and support their main hypothesis.

My only minor comment is that there are minor grammatical errors throughout the manuscript, so I'd recommend the authors ask a native English speaker go through and do minor edits to the language.