

Biogeosciences Discuss., referee comment RC2
<https://doi.org/10.5194/bg-2022-29-RC2>, 2022
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Comment on bg-2022-29

Anonymous Referee #2

Referee comment on "Relationship between extinction magnitude and climate change during major marine and terrestrial animal crises" by Kunio Kaiho, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-29-RC2>, 2022

- The novelty of this study has not been established. The MS says 'relationships between... physical conditions and the magnitude of animal extinctions have not been quantitatively evaluated. My analyses show that the magnitude of major extinctions in marine invertebrates and that of terrestrial tetrapods correlate well with the coincidental anomaly of global and habitat surface temperatures during biotic crises,'. However, it is not accurate that this has not been previously quantitatively evaluated. In particular, Song et al 2021 (Nature Communications) has also published a quantitative analysis of extinction magnitude and temperature change which appears to show, with a larger, statistical analysis, similar conclusions to those stated here (there is also a relevant response paper McPherson et al. 2022 Results in Engineering). E.g. Song et al 2021, which is omitted from the citations of the submitted MS, already concluded, 'The results show that both the rate and magnitude of temperature change are significantly positively correlated with the extinction rate of marine animals.' There is also a branch of the literature considering specifically the correlations and potential periodicity of extinction and bolide impacts. I believe the author of the current MS needs to explain and adequately justify what it is about their findings that is novel with regard to the recent literature for publication to be considered.
- Table 1 shows that the submitted study is based on secondary data compiled from the references indicated there, covering a small sample of 7 geological boundaries. However, it has not been adequately demonstrated that these secondary data are directly comparable. E.g. There are a range of different methods available for calculating extinction magnitudes and it has not been demonstrated that the compiled data use comparable measures e.g. interval lengths, precise choice of numerator and denominator etc. An analogous point also applies to the temperature proxy data.
- There is apparently no statistical analysis provided to test the presented results or conclusions. Furthermore, there is a small sample size of 7 geological boundaries indicated in Table 1, with only 2 events outside the traditional big 5 extinctions. In contrast, for example Song et al 2021 and Fan et al 2020 (Science) have published large statistical analyses, of consistent datasets covering complete series of extinction magnitudes (not hand-selected examples), to test correlations between extinction and environmental proxies.
- There is currently inadequate consideration of potential effects of sampling bias on measures such as % extinction. This issue does not appear to be discussed at all despite its considerable importance in this research area. See for example, Alroy (2014 Paleobiology).

