

Sept 21st, 2025

Dear Dr. *Ewa Bednarz*,

On behalf of my co-authors, I am pleased to submit the revised version of our manuscript titled “Unequal socioeconomic exposure to drought extremes induced by stratospheric aerosol injection” for further consideration in *Atmospheric Chemistry and Physics*.

We sincerely appreciate the editor and reviewers’ insightful comments and constructive suggestions, which have significantly improved the rigor and clarity of our work. In this revision, we have made minor changes in response to the referees’ comments. A detailed response to each of your comments is shown below.

We are grateful for the opportunity to refine this work and thank you for your time. Please do not hesitate to contact me if you have any further questions regarding the manuscript. I look forward to hearing from you.

Yours sincerely,

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Editor

- *Section 2.6: Please change 'offline experiments' to 'offline calculations', as it's otherwise still confusing to the reader.*

➤ Corrected as suggested.

- *Section 3.1: I'd like to see a few references to past studies looking at changes in P and T from GeoMIP G6 and GLENS (so as to make it clear those particular results are not new).*

➤ We have added following references that analyze the temperature and precipitation responses in GeoMIP and GLENS in section 3.1 as suggested:

- (1) Bednarz, E. M., Visioni, D., Banerjee, A., Braesicke, P., Kravitz, B., and MacMartin, D. G.: The Overlooked Role of the Stratosphere Under a Solar Constant Reduction, *Geophysical Research Letters*, 49, e2022GL098773, <https://doi.org/10.1029/2022GL098773>, 2022.
- (2) Tilmes, S., Richter, J. H., Kravitz, B., MacMartin, D. G., Mills, M. J., Simpson, I. R., Glanville, A. S., Fasullo, J. T., Phillips, A. S., Lamarque, J.-F., Tribbia, J., Edwards, J., Mickelson, S., and Ghosh, S.: CESM1(WACCM) Stratospheric Aerosol Geoengineering Large Ensemble Project, *Bulletin of the American Meteorological Society*, 99, 2361-2371, [10.1175/bams-d-17-0267.1](https://doi.org/10.1175/bams-d-17-0267.1), 2018.
- (3) Kravitz, B., MacMartin, D. G., Tilmes, S., Richter, J. H., Mills, M. J., Cheng, W., Dagon, K., Glanville, A. S., Lamarque, J.-F., Simpson, I. R., Tribbia, J., and Vitt, F.: Comparing Surface and Stratospheric Impacts of Geoengineering With Different SO₂ Injection Strategies, *Journal of Geophysical Research: Atmospheres*, 124, 7900-7918, <https://doi.org/10.1029/2019JD030329>, 2019.
- (4) Da-Allada, C. Y., Baloitcha, E., Alamou, E. A., Awo, F. M., Bonou, F., Pomalegni, Y., Biao, E. I., Obada, E., Zandagba, J. E., Tilmes, S., and Irvine, P. J.: Changes in West African Summer Monsoon Precipitation Under Stratospheric Aerosol Geoengineering, *Earth's Future*, 8, e2020EF001595, <https://doi.org/10.1029/2020EF001595>, 2020.

- *Section 3.4. L. 422: "varies to a certain extent among models" -> "varies strongly*

across the GeoMIP models". As the other reviewer had pointed out, the errorbar on that figure is huge!

- We have corrected as suggested: “It is important to note that under both SRMs, the exposure of the GDP and population for the low HDI countries varies strongly across the GeoMIP models.”

- Section 3.4. L.428-429: I'm not convinced really that GLENS shows risk amplification compared to GeoMIP, but rather GLENS is just the result of one model while GeoMIP is a multi-model mean (of very different single model results, as shown by the errorbar on that plot). Please rephrase.

- related to the above - why the authors didn't include CESM results for GeoMIP? That would make for a better comparison with GLENS (as it's the same model).

- Thank you for this valuable comment. We agree that a direct comparison of CESM results between GLENS and GeoMIP would be informative. However, the CESM output in GeoMIP lacks certain variables required to calculate the sc-PDSI drought index, which prevent us from performing such an analysis. We also acknowledge that comparing a single-model ensemble (GLENS) with a multi-model mean (GeoMIP) requires careful interpretation. To address this, we have moderated our statement as follows: “As a comparison, the SAI in GLENS shows elevated drought exposure for medium- and low-HDI countries compared to the SRM approaches in GeoMIP6 (Figs 10a-b).”

Reviewer

- "By the end of this century, the GLENS strategy successfully maintained the temperature at 2020 level" should be "maintained global mean surface temperature"

- "This may be attributed to its multi-latitude injection strategy and the dynamic adjustment of injection amounts at different latitudes to fully offset future warming". GLENS does not 'fully' offset warming at all model grids!

- We have corrected as suggested: “By the end of this century, the GLENS strategy successfully maintained global mean surface temperature at 2020 level...”
“This may be attributed to its multi-latitude injection strategy and the dynamic adjustment of injection amounts at different latitudes to largely offset future warming (Fig. 3).”