Authors' Response to Review by Editor

Franziska Zilker[1,4], Timofei Sukhodolov[2], Gabriel Chiodo[1], Marina Friedel[1], Tatiana Egorova[2], Eugene Rozanov[2,3], Jan Sedlacek[2], Svenja Seeber[1], and Thomas Peter[1]

[1]Institute for Atmospheric and Climate Science (IAC), ETH, Zurich, Switzerland
[2]Physikalisch-Meteorologisches Observatorium Davos/World Radiation Center, Davos, Switzerland
[3]St. Petersburg State University, St. Petersburg, Russia
[4]Swiss Federal Institute for Forest, Snow, and Landscape Research (WSL), Birmensdorf, Switzerland

Correspondence: Franziska Zilker (franziska.zilker@wsl.ch)

We thank the editor for his insightful comments and suggestions to our manuscript. We responded to them in detail below. The editor's comments are given in black and our answers are indicated in blue. We also explained minor corrections introduced by ourselves. The line numbers indicated in the response refer to the revised manuscript. The authors' track-changes file is attached with all changes highlighted (generated with latexdiff).

(i) Your abstract concludes with 'avoid regional amplifications of negative climate impacts' and your conclusions with 'regional amplification of adverse effects on surface climate'. The message is that the Montreal Protocol has avoided negative regional climate impacts. But as far as I can tell you don't really specify what these negative regional climate impacts might be – you simply point to changes the circulation. Can you spell out very briefly what the adverse effects might be – e.g. perhaps you are thinking that poleward contraction of the SH eddy driven jet in austral summer will reduce rainfall in southern Australia? Perhaps you can cite a paper that links the type of circulation changes that you are considering to specific 'adverse effects'?

Thank you for making us aware of missing examples. We added an example for the SH referring to Fig. 7b in Egorova et al. (2023), where we show that the more positive SAM phase would have shifted regional precipitation patterns and how it is similar to local climate change tendencies (Lee et al., 2023) (lines 245-251). For the NH, we added the increased precipitation in the Pacific sector again referring to Egorova et al. (2023) and Lee et al. (2023) (lines 271-274). We also put the regional warming in the Arctic region into perspective, by comparing it with the IPCC AR6 (Lee et al., 2023) (lines 299-302). We summarized the amplification of adverse effects in the conclusions (lines 350, 355-357).

(ii) I've seen a couple of typos – e.g. 'topical' in l236 should be 'tropical', the 'J.W.' in the cited reference in l285 should be removed. Please check for others.

Thank you. We have corrected the indicated typos and also checked for others.

Additional corrections

- "noMPA_noCFCRad" and "noMPA_CFCRadOff" were used interchangeably in the text. We decided to use "noMPA_CFCRadOff".
- We indicated in the figure captions for colormaps showing differences that the color saturation is different for negative and positive values (where applicable).

l. 10: We changed "vortex" to "wind" to avoid the misleading statement of a summertime polar vortex.

l. 115, 130 The preprint Egorova et al. (2022) was still cited which we changed to the publication Egorova et al. (2023)

l. 123 We changed ";" to "and" to allow for better readability of the citations in the text.

Figs 1, 8, D1: We corrected the legends from "noMPA_noCFCRad" to "noMPA_CFCRadOff" to be consistent with the rest of the text.

Figs. 7, 8: We moved them in the text, therefore the track-change file shows the deletion of the captions where they were before.

App. B: Appendix B was move to D to match its occurrence in the text.

References

Egorova, T., Sedlacek, J., Sukhodolov, T., Karagodin-Doyennel, A., Zilker, F., and Rozanov, E.: Montreal Protocol's impact on the ozone layer and climate, Atmospheric Chemistry and Physics Discussions, 2022, 1–19, https://doi.org/10.5194/acp-2022-730, 2022.

Egorova, T., Sedlacek, J., Sukhodolov, T., Karagodin-Doyennel, A., Zilker, F., and Rozanov, E.: Montreal Protocol's impact on the ozone layer and climate, Atmospheric Chemistry and Physics, 23, 5135–5147, https://doi.org/10.5194/acp-23-5135-2023, 2023.

Lee, J.-Y., J. Marotzke, G. Bala, L. Cao, S. Corti, J.P. Dunne, F. Engelbrecht, E. Fischer, J.C. Fyfe, C. Jones, A. Maycock, J. Mutemi, O. Ndiaye, S. Panickal, and T. Zhou: Future Global Climate: Scenario-based Projections and Near-term Information, in: Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, edited by Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou, pp. 553–672, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1 edn., https://doi.org/10.1017/9781009157896, 2023.