

Reply on RC1

Kalle Nordling et al.

Author comment on "Understanding the surface temperature response and its uncertainty to CO₂, CH₄, black carbon, and sulfate" by Kalle Nordling et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-401-AC1>, 2021

We would like to thank Reviewer 1 for the constructive comments and suggestions. All changes are marked with red color to revised manuscript

- 47: see also Gillett et al. 2021: <https://www.nature.com/articles/s41558-020-00965-9>
 - citation added. Since the cooling effect of aerosols in the Gillett et al. was estimated to be lower than that in the original references, we also included this estimate and changed the sentence to "Modern day anthropogenic aerosols cool the global surface temperatures between 0.1-1.1 °C."
- 56: Furthermore, the differences in regional distributions of aerosol surface temperature responses are not dominated by the aerosol description in modern climate models (Nordling et al., 2019). I'm a bit confused by this sentence.
 - The sentence is now changed to: Furthermore, the differences in aerosol surface temperature response between modern climate models are not dominated by the aerosol description (Nordling et al., 2019).
- fig1. last panel should be (f),
 - This is now fixed
- 117: How should the reader interpret ΔT and $\Delta \epsilon_{eff}$? Are they local changes?
 - Yes, they are local changes. The paragraph below Equation 2 clarifies that all changes are local.
- 186: maybe "largely" independent. There's still some possible cross-pollination of code bases and research teams.
 - Changed according to the suggestion.
- 233-234 and further on: stylistic, but using \pm rather than std looks cleaner.
 - Changed according to the suggestion.
- 247: here 5xsulf and 10xbc, previously sulx5 and bcx10
 - changed to sulx5 and bcx10
- 267: instant -> instantaneous
 - changed
- 268-270: suggest slightly revising the grammar of this sentence as the multiple dashes are confusing.
 - This has been done. The dashes have been removed.
- Figure 5: Add units somewhere in either the caption or y-label axis. I think it's K/(W/m²).
 - Units have been added The same was done for fig 7.
- 357-358: Barents Sea - will have to take your word for it as not too obvious from the resolution of figure 4!

- Color scale has been changed, extremes are now more visible. This is also more visible in the LW clear-sky term.
- 382: bcx10 or sulx5?
 - this typo is fixed
- 485: $\Delta SURF + \Delta SURF$
 - typo fixed