

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-401

Anonymous Referee #2

Referee 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-RC1>, 2021

This paper shows the contributing factors to surface temperature and surface energy budget changes for four different forcing agents using six climate models from the PDRMIP project.

I don't see any big issues with this paper and have just a few comments as follows.

- 47: see also Gillett et al. 2021: <https://www.nature.com/articles/s41558-020-00965-9>
- 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.
- fig1. last panel should be (f)
- 117: How should the reader interpret ΔT and $\Delta \epsilon_{\text{eff}}$? Are they local changes?
- 186: maybe "largely" independent. There's still some possible cross-pollination of code bases and research teams.
- 233-234 and further on: stylistic, but using \pm rather than std looks cleaner.
- 247: here 5xsulf and 10xbc, previously sulx5 and bcx10
- 267: instant -> instantaneous
- 268-270: suggest slightly revising the grammar of this sentence as the multiple dashes are confusing.
- Figure 5: Add units somewhere in either the caption or y-label axis. I think it's K/(W/m²).
- 357-358: Barents Sea - will have to take your word for it as not too obvious from the resolution of figure 4!
- 382: bcx10 or sulx5?
- 485: $\Delta \text{SURF} + \Delta \text{SURF}$