

## ***Interactive comment on “How aerosols and greenhouse gases influence the diurnal temperature range” by Camilla W. Stjern et al.***

**Anonymous Referee #1**

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This paper presents an analysis of the PDRMIP experiments and assesses the effect of different agents (CO<sub>2</sub>, black carbon, and sulphate) on the diurnal temperature range. This is an important topic of research and the analysis presented here makes a valuable contribution. However, there are a few minor issues that should be addressed prior to publication.

General comments: I think the figures are useful and well presented, but in a couple of places I miss some more elaboration on the results shown therein. See specific comments below.

Minor points: L45: As you allude to later (L63) the relationship between radiative forcing and SAT is non-linear (especially in shallow, stably-stratified conditions, such as mid-late winter T<sub>min</sub>) because it is modified by the near-surface mixing strength; I think this

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should be clarified here.

L55: In the previous sentences you argue that LW changes effect both the T<sub>max</sub> and T<sub>min</sub>, but that SW changes affect the T<sub>max</sub> more strongly, but then here you should make clear that in the polar night, in the absence of SW, LW changes effect both T<sub>max</sub> and T<sub>min</sub>.

L69: “Informed projections” I think you should expand on what you mean by that i.e. pathways derived from IAMs

L113-114: I think the choice of the Arctic as a region of interest needs some clearer justification as you have already mentioned the DTR here is not so much driven by diurnal variations in SW forcing.

L124: The multi-model median is referred to as 10.8K, but in the corresponding figure 2 this looks like it is less than 10K – am I missing something or is this number referring to the mean perhaps?

L136: Here and elsewhere when you refer to comparison of geographical patterns the analysis is qualitative, but it would benefit from being supplemented by some quantitative measures of pattern similarity e.g. correlation coefficient between patterns.

Related to Figure 2: For the T<sub>min</sub> plot all the individual regions are either warmer or the same temperature in the models as compared to the observations, while in the LND average the models are colder. Since this somewhat undercuts the argument about choosing representative regions around the globe, I think this should be commented on.

L167: Again, we have a qualitative statement about pattern similarity which would benefit from a quantitative statement to support it.

Technical issues: L66: pattern(s)

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