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Discussions

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Interactive comment on "The regional temperature implications of strong air quality measures" *by* Borgar Aamaas et al.

Anonymous Referee #1

Received and published: 6 September 2019

General Comments

This is a well written and interesting study that explores how optimal mitigation of short-lived climate forcers could contribute to cooling (or reduced warming) over the next few decades. It provides useful information for policymakers considering how to limit warming through non-CO2 measures. There are, of course, many uncertainties, but this study demonstrates very nicely what could be done. My main concern is that the uncertainties in the ARTP values should be discussed more deeply than they are currently; this also extends to better explanations of the error bars on some of the figures (see below). If this point and the other, relatively minor points below are addressed, then I am happy to recommend publication in ACP.

Specific Comments

In the Abstract, clarify that mitigation of some SLCFs (e.g. SO2) leads to warming.

P1 l7 Change text to: '. . .policies is, however, still uncertain.'

P1 l21 'outsized impact' -> large impacts?

P2 l7 SLCFs -> SLCF

P2 l19 I think you need to say something like ". . .may lower the global temperature by 0.22C in 20141-2050 compared to a reference scenario."

P2 l19 "complete removal of anthropogenic aerosol emissions (BC, OC, SO2). . ." SO2 is, of course, an aerosol precursor, not an aerosol. "Complete" seems excessive, as I don't think you mean removal of species like NOx and NH3 (which are also aerosol precursors), so I would use slightly less all-encompassing language here.

P2 l22 ". . .a range of the UN SDGs." This is a bit vague – presumably you mean air quality, food security, etc. Can you be a little more specific?

P2 l24 potential of SLCFs.

P2 l29 delete 'that'

P2 l32 State year for 'current legislation' – 2019?

P3 l1 technically

P3 l20, l22 capitalise Absolute

P3 l25 How well constrained/model dependent are the (crucial) ARTP values? This is rather important and deserves some discussion. For example, is nitrate aerosol included in the model(s)? How are the indirect effects of aerosols handled in the model(s)? Do the models include interactive vegetation, e.g., that responds to air pollution induced damage? How do the models represent the mixing state of aerosols? Do we have any idea about how these missing processes (I am assuming they are missing) will affect the model results? I appreciate that you can only use state-of-the-

art models to make your best estimate of temperature responses, but some discussion of how uncertain the results (ie ARTP values) are should be included, to give some perspective. I note you do quote errors on your values – but I think these cover just the known unknowns.

P5 l18-l26 Please quote values +/- errors correctly. It is incorrect to quote -0.33 +/- 0.083 C. The error should probably only be quoted to one significant figure, although you may feel justified to quote to two, as you have done. But the value then needs to be quoted to the same number of decimal places as the error, i.e. it should be, e.g., -0.335 +/- 0.083 C, or -0.33 +/- 0.08 C. The same inconsistency appears on several of the subsequent lines.

P6 l2 on -> in

P6 l5 on -> to

P7 l2 estimates

P7 l11 usage -> use

P7 l20 it contributes -> they contribute

P8 l14 values -> value

P8 l15 is -> are

P8 l24 SLCFs reduction -> SLCF reductions

P8 l30 implicitly

P9 l3 how -> what

P9 l18 . . .may be smaller than those estimated here. . .

Figure 2 caption should explain the origin of the error bars.

Figure 4 caption should explain the origin of the error bars (on the global values).

Figure 5 caption – the explanation of the error bars could be clearer.