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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global direct aerosol radiative forcing, as constrained by comprehensive observations" *by* Chul E. Chung et al.

Anonymous Referee #1

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Thank you for the clarification. Indeed, it is stated in the last sentence of your abstract that your estimate does not exactly represent the radiative forcing of anthropogenic aerosols. However, it was easy to misinterpret this, since (i) the concepts of aerosol radiative effect and (anthropogenic) radiative forcing are not properly separated in the paper; (ii) clearly, the underlying motivation of the paper seems to be to estimate the direct radiative forcing due to anthropogenic aerosols (you just cannot quite get there) and (iii) your estimate is compared in the abstract with the value -0.35 ± 0.5 W m^{-2}, which is the IPCC AR5 estimate for the direct radiative forcing (or "aerosol-radiation interaction") of anthropogenic aerosols. Regarding this latter point, it is worth noting that your best estimate of -0.10 W m^{-2} for the radiative effect of carbonaceous, sulfate

and nitrate aerosols actually seems to be quite consistent with the IPCC AR5 estimate of the anthropogenic radiative forcing. To get from your estimate to the anthropogenic forcing, one should (at least):

- Add the contribution of "anthropogenic" dust. Assume, for the sake of the argument, that the IPCC AR5 best estimate (-0.10 W m^{-2}) is valid.
- Subtract the contribution of natural BC. Assume that this is represented by the Bond et al. (2013; Sect. 10.4.1 and Fig. 35) year 1750 value of $+0.17$ W m^{-2}.

Thus, one ends up at: -0.10 W m^{-2} -0.10 W m^{-2} -0.17 W m^{-2} = -0.37 W m^{-2}, which happens to be very close to -0.35 W m^{-2}. Therefore I would argue that the statement on p. 9, line 4 ("we posit that the aerosol direct radiative forcing is less negative than the concensus") is not necessarily true.

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