

Interactive comment on “Radiative forcing of climate change from the Copernicus reanalysis of atmospheric composition” by Nicolas Bellouin et al.

Anonymous Referee #1

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This paper describes a data set of climate radiative forcing (2003-2016) calculated from the Copernicus reanalysis of atmospheric composition, including CO₂, CH₄, O₃, and aerosol. Because these atmospheric constituents are constrained to some extent by observations through data assimilation approach, the derived radiative forcing is believed to be more reliable than free-run GCM simulations. The data set would be useful to several applications. The paper is generally well written. I would recommend the paper be published in ESSD after some clarifications (mostly technical nature).

1. in the abstract, I would suggest that they split ozone and aerosol radiative forcing numbers (line 25-26) into two components, i.e., tropospheric and stratospheric for

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ozone, ARI and ACI for aerosol. Nevertheless, it says that they are dealing with 6 forcing agents.

2. line 85-94: it is helpful to say something more about the CAMS, e.g., what kinds of observations have been used in the reanalysis. A table may be adequate.

3. line 100: "2003-2018" I found that all related figures are for 2003-2016.

4. line 146: neglecting aerosol scattering in the LW spectrum may introduce significant uncertainty. Maybe it is useful to discuss the uncertainty here.

5. line 210-211: "Anthropogenic fractions therefore peak in late summer in South America and southern Africa". I think it should be "boreal summer".

6. line 259-261: Do recent satellite-based estimates of above-cloud aerosol radiative effect justify their neglect of cloudy-sky radiative effect?

7. Line 425-427: Randles et al. (2013) assessed the uncertainty in RF_{ARI} associated with the two-stream approximation, which could be included here.

8. Line 519-520: "Interestingly, cloud masking of RF_{ari} is larger than RF_{aci}". it is kind of confusing.

9. line 622: need to define "rate of change". Which two years are used to calculate the change, year n and n-1 or year n and n+1?

10. line 601-606: which satellite AOD data has been used in the reanalysis? can these trends be attributed to spurious trends in the satellite AOD?

11. Figure 7. you need a legend for those colored lines.

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