

Interactive comment on “An aerosol climatology for global models based on the tropospheric aerosol scheme in the Integrated Forecasting System of ECMWF” by Alessio Bozzo et al.

Anonymous Referee #2

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Reviewer comments to

"An aerosol climatology for global models based on the tropospheric aerosol scheme in the Integrated Forecasting System of ECMWF. Alessio Bozzo 1* , Angela Benedetti 1 , Johannes Flemming 1 , Zak Kipling 1 , and Samuel Rémy 1,2"

This is a generally well written and comprehensive paper that documents the new CAMS aerosol climatology and illustrates its application in the ECMWF forecast model. Interesting new results concerning the dynamic impact of aerosols on model results over certain areas of the globe are presented and analysed. The paper can be used as a document of the CAMS aerosol climatology data set by NWP modellers and other

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users. For this, it is important to get also the details carefully presented. As not only NWP modellers are interested in the aerosol impacts, it would be good to avoid NWP-specific jargon and implicit assumptions that the reader is familiar with e.g. the data assimilation methods.

Detailed remarks and questions are presented below

p1 l6 ... set of model simulations ...

p1 l7 re-analysis or reanalysis, please check consistency throughout the paper

p1 l8 Aerosol Optical Thickness (AOT) or aerosol optical thickness, also check consistency

p1 l15 ... improve the simulation of summer monsoon circulation ... Are the words like Monsoon or Tropics or Dimethyl Sulfate written with capital letters?

p1 l24 Please check the consistency of years of both Baklanov et al. references in text/list of references

p2 l6 remove 'and' from ...prognostic aerosol field -and- because ...?

p2 l16 feed-backs of feedbacks, please check consistency

p2 l25 ... multi aerosol model simulation.. or ...multi-aerosol... ?

p2 l28 ... teleconnections ... instead of tele-connections Perhaps check all combinations of adjectives and nouns including or not including '-' ?

p4 l8-9 Dust emissions do not really depend on albedo, perhaps something like: 'in the model, emissions of dust are related to ...

p4 l10 sea salt instead of Sea-salt

p4 l13 SO₂ instead of SO₂, mention the relation between SU and SO₂

p4 l16 ... an extra control variable +and+ using a variational bias correction ... ?

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p4 I.19 AERONET reference, definition. You might consider an attachment table of acronyms with references?

p4 I23 ... same meteorological fields and emission +data+ as CAMSiRA ?

p4 I29 ... each specie... instead of 'species'? Or at least consistently.

p4 I31 For what you used the scaled AOT - not only for diagnostics but for something more fundamental in derivation of the mmr? Please explain in this paragraph.

p4 I32 Please explain why kg/m³ and not kg/kg as usually, e.g. in the available via CAMS near-real-time data. For this paper it may not be important as only layer-integrated values kg/m² are shown but for data users this may be confusing.

p5 I12 What means "generally" in this sentence?

p5 I19 ... organic and black carbon species ...

p5 I23 Please discuss volcanic (stratospheric) ash and sulfates in this context: are they included in the climatology, what are the uncertainties etc. Do the dust/sulfate optical properties apply to these as well?

p5 I30 Would be logical to start from appendix A, i.e. change the order of the appendices

p5 I32 ... away from the +near-surface+ sources?

p6 Fig 1 caption ... have been multiplied by 10 ... Not the mean values shown, though?

p7 I6 ... non-negligible... ? Somewhere later you also use 'not negligible', please check consistency

p9 Fig 3 caption ... mineral dust ... from CR fields, the right ... while for organic matter +it+ is 2 km ...

p9 I5 ... emissions of black +carbon+ ...

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p9 I3 Why ... it is smaller over Europe... ? Sulfates?

p9 I6 ... while showing ...

p11 I13 You have selected the sites based on dominant aerosol species. You might mention for each site what is dominating in terms of the 5 categories used here. Would an additional Eastern European site in show in early summer something interesting related to organic (pollen etc) aerosol? Does the Karachi site show mineral (desert) dust impact? Lake Argyle seems to be in Australia, what aerosols are there? Showing a small map of the locations might also help.

p12 Table 1 CAMSiRA 2008 v.s. CAMSiRA clim remains unclear. Also further in Fig.5 you refer to CAMSiRA original. Please clarify. Is CAMSiRA (original) run for 2008 without scaling of AOT, does CAMSiRA contain your scaling?

p12 I7 Please clarify what means "compared to the IFS configuration using the old climatology based on TG97", i.e. what exactly are the differences between the configurations. See also the next comment.

p14 <I7 Please add a paragraph summarising how the radiation scheme of your experiments (Hogan and Bozzo, 2018?) treats the aerosol input in case of CAMSiRA mmr + new IOPs v.s. Tegen AOD:

- which variables enter the radiation parametrizations (AOD, SSA, ASY at each 3D gridpoint?)
- vertical distributions - native or exponential
- assumptions concerning SW and LW radiation (e.g. scattering, wavelengths really used)?
- something else?

p14 I7 What do you mean with 'model mean state' in climate runs? You only discuss the radiation fluxes, which is fine, so perhaps remove the mean state from here?

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p15 I1 CERES-EBAF definition, reference (into a table of acronyms?)

p16 I17 remove extra 'on'

p17 I5 ...desert +(in China)+ ... It is perhaps Takla Makan desert?

p18 I5-10 Please reformulate this interesting list with less jargon like 'driven in part by the operator splitting of convective transport and scavenging', 'assign far too much positive increment to black carbon'

p18 I9 Please remind what are the biomass burning species

p18 I12 ... non-negligible ...?

p19 Section 4.4 is very interesting!

p19 Table 2 Definition, references to all "different products"

p20 I4 Please reformulate 'helps reducing the first-guess departure ...'

p20 I12 Is 'in the Indian Ocean' correct, or perhaps 'over'?

p21 I8 Would it be possible to say something about changes in clouds, not due to explicitly accounting for cloud-aerosol microphysics interactions but resulting anyway?

p22 I15-16 ... modifies the strength of temperature and pressure gradients over the Indian Ocean ... It seems that you did not directly show the temperature and pressure gradients but the resulting wind fields and 925 geopotential (relative topography 850-100 would directly show the mean temperature). Perhaps consider how to formulate this conclusion better.

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