

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 #1

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General comments:

The manuscript is well written can be useful for potential users of the CAMSiRA aerosol climatology. In particular in showing the effects of the impacts of radiation fluxes using the new climatology in the IFS forecast system the effects of the new climatology are presented.

A major concern is that the aerosol climatology is only evaluated in terms of AOT. As the new aerosol climatology was constrained by MODIS AOT, it is nice to know but unsurprising that the new CAMSiRA climatology provides a better match with AOT measurements compared to the older Tegen et al. (1997) climatology given that the

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older climatology was compiled from a results of very early attempts at aerosol tracer models using very coarse models and use emission fields that are meanwhile outdated. While it is a good start to look at regions that are dominated by specific aerosol types (although at most stations AOT will be a result of mixtures of different aerosol types, e.g. at Midway Island there is likely a contribution from sulfate AOT) it is notable that in particular for mineral dust evaluation at sites that are dominated by dust are absent, and should be added. As it is important for its radiative effect, particularly the effect on the Indian summer monsoon, the authors should also compare their absorbing AOT with the AERONET absorbing aerosol product. This should be a straightforward extension of the already existing analysis. Ultimately other aspects such as the mixing ratios or number size distributions will be used (e.g. for simulating indirect effects of aerosol particles on clouds). Aerosol composition will play a major role for these aspects. How about comparing other aspects such as near surface concentrations?

Specific comments:

1. While the introduction section gives a detailed overview about the role of aerosol climatologies in NWP and in particular for the ECMWF model, to avoid confusions the section would benefit from a table listing the current and previous aerosol climatology versions.
2. Page 4, line 32: What does ‘mass volumetric concentration’ mean? Do you just mean ‘mass concentration’?
3. Page 5, lines 21-25: This sentence is not clear, please explain in more detail what is meant by ‘not efficient coupling’ between convective transport and scavenging/speciation/vertical distribution of analysis increments.
4. Figure 1 The labels with numbers in some of the panels (top 2 rows) are not explained. Are they actually needed?
5. Figure 1: In addition to mass load, the distribution of the AOTs of the individual

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species would be interesting, as the AOTs ultimately determine the radiative effects. This would also support the choice of Aeronet locations relevant for individual aerosol types. These locations could be indicated on such AOT maps.

6. Figure 4: Additional difference plots between the two climatologies would be useful to highlight their key differences.

7. Page 11 and figure 5: At least one Aeronet station dominated by mineral dust should be added, as this aerosol type caused major differences between the climatologies.

8. Figure 5: what causes the dips in the green line (Tegen climatology) at the beginning of each month?

9. Page 14, lines 10-11: Please state here for which years the 'forecast runs' are performed. In the caption of Figure 8, the period May to August of the year 2016 is named, which should also be stated in the text.

10. Figures 6 and 7: Please provide the information on the years of the simulations in the figure captions

11. Figure 10: If, as stated in the figure caption, the figure shows also zonal winds as in Figure 9, why is the unit m^2/s^2 rather than m/s ?

Minor corrections:

12. Abstract, line 1: 'global atmospheric models' – the words should not be starting with capital letters

13. Abstract, line 3: into -> in

14. Abstract, line 8: ... assimilating -the- aerosol optical thickness. ...

15. The authors use at several places in the manuscript the expression 'specie' for singular of 'species'. Please check if that is the correct usage of the singular word here. (I am not a native speaker, but would also use species for singular and plural in

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this context)

16. Page 6, figure 1 caption, line 1: Interim reanalysis is written as interim Reanalysis at other places in the manuscript, please make sure it is written with the same capitalization everywhere.

17. Page 7, line 29 ad -> and

18. Page 10, figure 4: I suggest to place the figure labels (a and b) above and not below the figures

19. Figure 5: The lines in figure and the labels are difficult to recognize. The lines should be thicker and the label fonts should be larger.

20. Page 17, line 10: fig -> Fig

21. Page 19, Table 2: Here the fonts are too large

22. Page 24, line 18 – The number 0.05 should probably be 0.5?

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-149>, 2019.

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