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Interactive comment on "Development towards a global operational aerosol consensus: basic climatological characteristics of the International Cooperative for Aerosol Prediction Multi-Model Ensemble (ICAP-MME)" *by* W. R. Sessions et al.

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Response to Reviewer 2 Sessions et al. We appreciate the time and thought into performing this review. Response to your comments are below.

Primary Notes:

Improve Abstract We removed the first several sentences. We believe they are covered in the introduction and we agree that it makes the abstract more readable. We did not

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remove the 'unnecessary details.' That part refers to the omission of BSC and UKMO from the analysis, but they should be kept in the paper/abstract as a political nicety.

Place model details in appendix Made an appendix.

Secondary Notes: P14939, L4: modal -> model

P14939, L5: No action. Data distribution method is in flux.

P14940, L24: ICAp -> ICAP

P14941-14948, sections 2.1.1-2.1.7: Fixed

P14949, L15: How did you initialize the model at the beginning of the forecast? Do all participating models (whose results are shown in this paper) have data assimilation system for aerosol properties? How different are the AOT ïňĄelds from individual models at +0h?

Each model has its own method of data assimilation or model initialization as is discussed in Appendix A. Differences in the models at +0h can surely be ascribed to these different initializations. However, we are not able to plot the analysis fields at t-0 as the MACC model does not have a 0 hour analysis of AOT due to the nature of its 4D var assimilations scheme. AOT for the MACC model is a diagnostic, while the analysis is performed in aerosol mixing ratio. This may be changed in the future through post-processing the aerosol mixing ratio at t=0 to obtain the corresponding AOD. This lack of AOT at t=0 for MACC is stated in 14952 L10.

P14949, L17: suggest to separate Fig.1a from the rest of panels in Fig1, since they are not related. Split figures, relabeled b-e to a-d, fixed in text.

P14950, L9-10: what is the size cutoff for the ïňĄne and coarse modes? There are no "size cuts" in the models, as we break out species by their fine (sulfate, biomass burning) or coarse mode (dust, sea salt) nature. For those models with multiple size bins they are integrated by specie. Fortunately, the SDA method for partitioning fina

and coarse mode AOT accounts for the tails of the distributions, thus we have an apples to apples comparison here.

P14951, L9: please deïňĄne "gross fractional error". Gross fractional error -> fractional gross error, added equations.

P14952, L15-16: please check the grammar here. Removed 'Although/do,' separated clause.

P14952, paragraph 2: do you use 6h mean values or instantaneous values? As in all forecast models, the X hour forecast is the instantaneous value at that time. We accept AERONET comparisons to +/- 3 hours of this time however. This is now stated more clearly.

P14952, L28-30: This sentence is not clear to me. Sentence removed. While accurate, it isn't necessary to explain rank histograms.

fP14956, L7-8: Where do they have lower biases? Added another reference to table 1. The table is referenced prior in relation to biases, but was at least a page or so back.

P14956, L14: Why at some sites the model biases are even smaller as forecast day increases? Does this indicate these sites are mostly affected by local/nearby sources and less affected by meteorology and the aerosol transport from remote areas? This is answered as part of the response to the following comment. But it does happen for some locations and parameters that sometimes even for meteorological forecasts to be more accurate day5 than day 2. This is likely connected to compensating model errors, and it's not necessarily an analysis problem. I am not sure it means that the sites are more affected by local sources, and less by transport

P14957, L3-4: why this implicates biases in the analysis? Meteorological analysis? The reviewer has a point that we need to be clear on language. We state that the bias is bigger earlier in the forecast cycle as a statistical outcome of our comparison.. This immediately implies the analysis is biased. Thus stating "perhaps. . ." is repetitive and

confusing. Thus we have reworded this to "This could implicate bias in the analysis, as the free running forecasts relax into lower error states before being erroneously jarred into high error by the assimilation process."

P14959, L12: How reliable is the AERONET dust AOT data? And which number in ïňĄg.9 is the ensemble mean? Please see P14951 paragraph 2 for information regarding Level1.5 and Level 2 errors and reliability. AERONET verification for the coarse mode and AOT is of great to concern to us. While 90% of the time, the stated AERONET verification standards hold, there are some circumstances when severe cloud contamination occurs. It is hoped that version 3 will correct a number of these issues. Figure 9 is the rank histogram, so all values represent number of times the observation obtained 'ranks' in relation to the members + ens. No number in the figure represents the ensemble mean, instead the bin heights represent the number of times the observations fell into a particular rank amongst the member models.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 14933, 2014.

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