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Geoscientific Model Development Discussions

Interactive comment on "JRAero: the Japanese Reanalysis for Aerosol v1.0" *by* Keiya Yumimoto et al.

Anonymous Referee #2

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This study developed a global aerosol data assimilation system based on a global aerosol transport model and a 2-dimensional variational data assimilation method. Validations for the reanalysis data were conducted and suggested that the accuracy of the reanalysis data were much higher than the free run of model. I think this paper is valuable for providing an efficient way to obtain high quality reanalysis AOD data through degrading the assimilation system from 3-dimensional to 2-dimensional. I also like the detailed description for the aerosol transport model, the data assimilation system, the observation data, and the set-up of the reanalysis for the global aerosol data assimilation system. I recommend it publish as a technical paper after addressing the following comments. 1. P8, L19-21. The sulfate chemistry in MASINGAR mk-2 includes seven gas-phase reactions and two aqueous-phase reactions. Recently, some studies suggested the CTM model generally underestimated the sulfate, which may be caused by

missing some key heterogeneous chemistry reactions in the model. Could you provide some discussions for this issue related to your sulfate modeling in MASINGAR mk-2. 2. P12, L3. The horizontal error correlation length L is set to 200 km. This may be small for the coarse model resolution of TL159. Could you give more explanation for that? Is that setting related to the localization scale showed in P11, L20-24? 3. P12, L27-28. Please provide more information for the observation error covariance matrix because it is a key issue for the quality of the reanalysis data. Are the standard deviations of the observation errors uniform over the whole model domain? 4. P13, L30-31. Meteorological nudging was performed for the AGCM. What variables in the AGCM were nudged? Is the nudging conducted at the same time step as the AOD data assimilation? 5. P14, L23-25. Sensitivity experiment was conducted through reducing the background error covariance and the chi-square value in the sensitivity experiment was shown. I am interesting in the impact of the change of the background error covariance on the accuracy of the reanalysis AOD data. Could you provide some results for that? 6. P19, L23-24. There is a statement for improving the 6-24h forecast. But I have not seen the experiment for the 24h forecasting.

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