General Comments: This manuscript describes the development and evaluation of a new global aerosol reanalysis system in Japan. The assimilation system is based on 2D-var method, and the assimilated observation is the corrected MODIS AOD. The reanalysis results are evaluated with both the MODIS AOD and the independent AERONET AODs. The results are interesting and valuable to aerosol data assimilation studies. The manuscript is scientifically sound, original, well written and concise. I recommend accepting it after minor revision as indicated below.

We thank a reviewer for careful reading our manuscript and for giving useful comments. We have deliberately and considered your comments. We believe that we have made adequate corrections and answers to your comments. In revised manuscript, the changes are highlighted by yellow markers.

Specific Comments:

1. P5 L3 says the forward model forecast aerosol volume mixing ratio, however the P8 L30 says the AGCM receives mass concentrations from the forward aerosol model. I confuse which is correct.

We unified to “mixing ratio”.

2. P11 L3 KK should be K. and how do you calculate the H and HT in the system?

We corrected Eq. (20). As mentioned Line 31 in Page 10, H and HT is the interpolation into observation space and its adjoint (transpose). In the present experiment, since we used the observations re-gridded into the model space, H and HT become the unit matrix.

3. P11 L20 how to construct the local regions in the assimilation system? And how to perform the analysis calculation independently in the system? Do you only have one analyzed variable (AOD) in each independent analysis? Please explain more about this.

In the present system, each element of $\delta\boldsymbol{\tau}^a$ is solved independently (see Eq. (19)). In the other word, the analysis increment of AOD at each grid is calculated independently.

Yes. Each independent analysis solves one analyzed variable at one grid, but uses observed AOD ($\boldsymbol{\tau}^o$), the forecast AOD ($\boldsymbol{\tau}^f$), and background and observation errors (included in $\mathbf{K}$) in the local region.

We modified the texts as follows:

"We introduced a localization technique used in LETKF to the system that divides the model space into local regions using a prescribed localization scale. The localization technique solves the analysis increment of AOD at each model grid with observations included in the local region independently (see Eq. (19)), reduces spurious error covariance with distance and enables parallel processing to be used to reduce computational cost."

4. Fig 5. In the FR experiment, do you run the model without restart every six hours? Do you integrate the model for five years one time? If so, does the frequently restart in the RA experiment affect the simulated results? Are the modeled results same with and without frequently restart?

In the FR experiment, we integrate the model for each year. The frequency of restart does not affect the model results.

5. P15 L5-10 Firstly, you said the dust particles were increased by assimilation for the Sahel, and you also said the dust particles were decreased for the Mediterranean Sea. Which is right? Could you explain it more?

The Sahel is the south of the Sahara Desert. The negative difference of dust over the Mediterranean Sea means that the model overestimated the dust over the Sahara Desert (the north of the Sahel), while the dust from the Sahel was underestimated by the model. We modified the text as follows:

"The negative difference around the Mediterranean Sea indicating that the model overestimate dust particles transported from the Sahara Desert."

6. P17 L9 December 2016? You experiments do not include the year 2016.

We corrected.

7. P18 L28 Fig.18g should be Fig. 18a.

We corrected.

8. The formula A2 is wrong.

We corrected.