Interactive comment on "*Evaluation of a regional air quality model using satellite column NO_2: treatment of observation errors and model boundary conditions and emissions*" by R. J. Pope et al.

The manuscript is improved after the revision. Authors evaluated the performances of AQUM, using the OMI NO_2 columns and conducting several sensitivity tests. Also, authors suggested an algorithm to reduce the retrieval errors via averaging satellite NO_2 column data and using AKs. The revised manuscript is valuable and acceptable for the final publication in ACP with following revisions.

i) As shown in Fig. 7a and 8b, the biases between the AQUM and OMI-derived NO_2 columns were influenced by the uncertainty in the anthropogenic point source emissions. Probably, there is also large uncertainty in the area source of NO_x emissions. I think that the uncertainty in the NO_x emissions used in the current study was not clearly/fully discussed for the evaluation of the AQUM in the revised manuscript. Therefore, authors should provide further discussion (or analysis) regarding the uncertainty in the manuscript.

ii) Authors presented Fig. 9c and d from the sensitivity runs utilizing GEMS LBC and 0.02 of γ_{N2O5}. I wonder the results from the sensitivity run combing MACC LBC with 0.02 of γ_{N2O5}. Which one produces better results, compared with the OMI-retrieved NO_2 columns? Also, I just wonder how the satellite and in-situ measurements were treated in the GEMS and MACC reanalysis data.

iii) Authors missed the previous question about '2-3. Aerosol surface area (A) in the Schwartz formula (Eq. 11)'. As mentioned in your manuscript, aerosol surface areas can be changed by hygroscopic growth of aerosols, depending on aerosol types and relative humidity. Also, there are other atmospheric processes such as coagulation and condensation/evaporation, related to the aerosol surface areas. I wonder how those processes are treated in the AQUM model.