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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluation of a regional chemistry transport model using a newly developed regional OMI NO_2 retrieval" *by* G. Kuhlmann et al.

Anonymous Referee #3

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The authors developed a high-resolution NO2 retrieval for OMI instrument over Hong Kong and surrounding PRD region by updating AMF recalculated from high-resolution ancillary parameters including surface reflectance, NO2 and aerosol profiles simulated from high-resolution CMAQ model. Compared with NASA standard product, the new retrieval results increased NO2 VCDs ande reduced the mean bias between satellite and ground observations. The study also found the correlation between CMAQ model simulation and RAQM ground measurement was low and had some biases over different regions. Compared with previous studies, the study suggested the new developed HK OMI NO2 retrieval reduced the bias of satellite measurements by utilizing

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more accurate surface reflectance and aerosol profiles. The subject is interesting and well-fitted within the scope of Atmospheric Chemistry and Physics. In order to clearly demonstrate the conclusion, additional information and minor revisions are needed before publication.

Minor points: 1. The study found low correlation between CMAQ and RAQM network measurements especially over Foshan and Guangzhou. Besides the factors from grid average and meteorological fields, the most important factor is emission inventory used in the model (line 10 at page 31066). Because the OMI NO2 retrieval is highly dependent on the a priori NO2 profile from CTM, the following bias between new OMI NO2 VCD and ground measurements is not surprise. This bias from the emission in model simulation and following NO2 retrieval can not be neglected when investigating the day to day time series. Previous studies (Mijling et al., ACP, 2013; Gu et al., JGR, 2014) used daily updated emission from NO2 satellite observation in the CTM model and following NO2 retrieval, which could help to solve the bias among CMAQ, RAQM and OMI NO2 VCDs. Although this study may not be able to use the updated emission in the CMAQ and OMI NO2 retrieval in current stage, the result from those previous studies may help to explain the issue in the study and can be updated in future work.

2. Line 18 at page 31055, the study used 50% filter for aerosol/cloud radiance fractions in the retrieval. Most previous studies (e.g. Boersma et al., 2004, 2007) used 30% cloud fraction filter in NO2 VCDs retrievals. The difference of cloud fraction filter can lead to large impacts on results. Did this study test the impacts from using different cloud fraction filter?

3. Line 3 at page 31041, the study claims only NO2 profiles have been replaced in earlier studies. However, Russell et al. (ACP, 2011), Lin et al. (ACP, 2012), Lin et al (ACP, 2014) have already investigated the impacts from surface reflectance and aerosol profile on the NO2 retrieval and NOx emission. The sentence should be clarified to avoid misunderstanding.

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