Anonymous Referee #2

This is an interesting paper focused on the evaluation of the CHIMERE predictions of NO2 using different NO2 emission estimates. It provides a test of the current MIX inventory for NO2 in terms of both magnitude and spatial distribution. The spatial distribution from a satellite based top-down inventory is also tested. The paper is able to make use of the new observations of NO2 available in China. The comparison and description of the NO2 observations is very good and this data set will be of interest to the science community. The conclusions that the MIX inventory totals for 2010 along with the updated 2015 satellite derived spatial distribution provide the most accurate prediction of 2015 surface NO2 concentrations is interesting.

Response: We thank Referee #2 for the encouraging comments. All comments and suggestions have been considered carefully and well addressed below.

However the analysis is based on taking the observed NO_2 concentrations and then applying, a model-based correction to "account for" know interferences in the instrument used for the NO_2 measurements. These corrections can be as large as 40% (Figure 5). The impact of this correction and uncertainty associated with using the model-based values for the correction should be discussed. What is the uncertainty in the model based values? Are there observation-based approaches that can be used to test this? There are many super sites in China now and they measure the various elements of NO_y and have better direct measurements of NO_2. Could such data be used to give some confidence to the scaling applied to the monitored data (at least at one or more points)?

Response: The bias in NO_2 measurements from chemiluminescent analyzers due to interferences from PAN and other NO_y species is significant, which can reach up to 50% (Dunlea et al., 2007). The correction approach adopted by this study has been fully validated in Lamsal et al (2008) and widely applied to correct the interferences (e.g, Bechle et al., 2013; McLinden et al., 2014). We agree that the correction has uncertainties, but not significant ones based on a literature review. It is a pity that the NO_y data measured by super sites in China are not available to us. Additional validation of the uncertainty of the correction is further expected when such kind of data is available. We have added the related discussions in Sect. 2.4 of the revised manuscript, as follows:

“It is difficult to quantify the accuracy of the correction factors and errors, as the collocated measurements of other oxidized nitrogen compounds are not public available. We used the standard deviation of the daily means of correction factors within a season as a measure of its uncertainty. The average standard deviations for all sites are 10%, which are comparable to the uncertainty level pointed out by the study of McLinden et al. (2014). ”

References

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