Response to referee #1

This paper presented a mosaic emission inventory of air pollutants for Asia, which is a combination of existing studies or progress in emission estimates by country and sector. Moreover the work made a comparison between selected inventories particularly for given countries and sectors. It is good to have such kind of results to support MICS-Asia and HTAP studies, as suggested by the authors. In general, the paper is well organized and clearly written. Some more explanations and discussions might be added to improve the work as follows.

Response: We thank the constructive comments given by the referee #1, which is very helpful to improve the manuscript. Our responses to each specific comment are presented below.

1. Methodology section. The reasons of inventory choice should be discussed. There are obvious overlaps in regions and species between current inventories, while the strategy of inventory choice was not sufficiently described. The readers would then question why the emissions of some species/regions were from a given inventory while the rest were from another. It would be clearer if the authors could present their preference when developing the mosaic MIX inventory.

Response: The following paragraph was added to Sect. 2.1 of the revised manuscript to indicate the hierarchy of the datasets.

"We then selected different emission datasets for various species for each country by the following hierarchy. REAS2 was used as the default where local emission data are absent. Emission inventories compiled by the official agencies or developed with more local information are selected to override REAS2, which include MEIC for mainland China, ANL-India for India, and CAPSS for the Republic of Korea. Detailed information and advantages of these inventories are presented in Sect. 2.2. As only a few species (SO_2, BC, OC, and power plant NO_x) were available from ANL-India, REAS2 was used to supplement the missing species. A mosaic process was then used to combine ANL-India and REAS2 into a single dataset for India emissions. It is worth noting that the REAS2 have incorporated local inventories for Japan and Taiwan, which are subsequently adopted in MIX for these two regions. PKU-NH_3 was further used to replace MEIC emissions for NH_3 over China, given that PKU-NH_3 was developed with a process-based model that represented the spatio-temporal variations in NH_3 emissions."

2. Section 3.2. It would be more interesting if the inter-annual trends in emissions could be analyzed by sector and species for countries other than China or India. It is well known that China started to conduct more and more stringent measures to control emissions since 2005, while such information is lacking or not well provided for other Asian countries. Moreover, the driving forces or reasons for the inter-annual trends should also be provided.

Response: In Sect. 3.2 of the revised manuscript, we added more discussions on inter-annual trend in emissions for different Asian regions.

3. For comparison section (Section 4), I understand it might be difficult to compare the detailed emission factors between MIX and EDGAR, but is it possible to make a more detailed comparison between MIX and REAS 2, for sectors/regions with different estimates in the two inventories?

Response: The estimates in MIX and REAS2 are only different for China, India, and Republic of Korea, where local emission inventories are incorporated to replace REAS2. MIX and REAS2 are same for other regions. Detailed comparisons for China and India between MIX and REAS2 are presented in the Sect 4.2 and 4.3 respectively.

4. Small issue: lines 22-24, P34833. Besides penetration, the removal efficiency that is also crucial for SO_2 estimates was assumed poorer than expected before 2010. Would that weaken the discussion here? I suggest a detailed quantitative comparison and analysis here for SO2 emission estimate.

Response: We have revised the statement as follows: "EDGAR's estimates for SO_2 emissions from power plants are 60% higher than estimates in MIX. For China, 70% of power generation capacities were equipped with FGD and the average SO_2 removal efficiency was 78% (Liu et al., 2015). The high estimates in EDGAR v4.2 most likely due to underestimation of FGD penetration or SO_2 removal efficiencies of FGD (Kurokawa et al., 2013)."