Reviewer#2

Having reviewed the paper, I find it to be scientifically sound and well-structured. However, I would recommend the following minor revisions to enhance its clarity and impact:

The discrepancies between GEOS model predictions and observations in cities like Guangzhou and Jakarta warrant further explanation. Perhaps including a brief analysis of the local emission inventory uncertainties would strengthen this section.

Response: Thanks for the excellent suggestion. We further analyzed our GEOS simulations (e.g., changes in PM2.5 components due to anthropogenic emission reductions and differing meteorology and natural emissions between 2020 and 2019) to better understand potential uncertainties contributing to the model's deficiency in capturing the observed PM2.5 changes in Guangzhou and Jakarta. The following figure (Figure 15) will be added in the revised paper with a discussion of modeling uncertainties. Similar charts for all other cities will also be provided in the supplementary material (Figure S10).

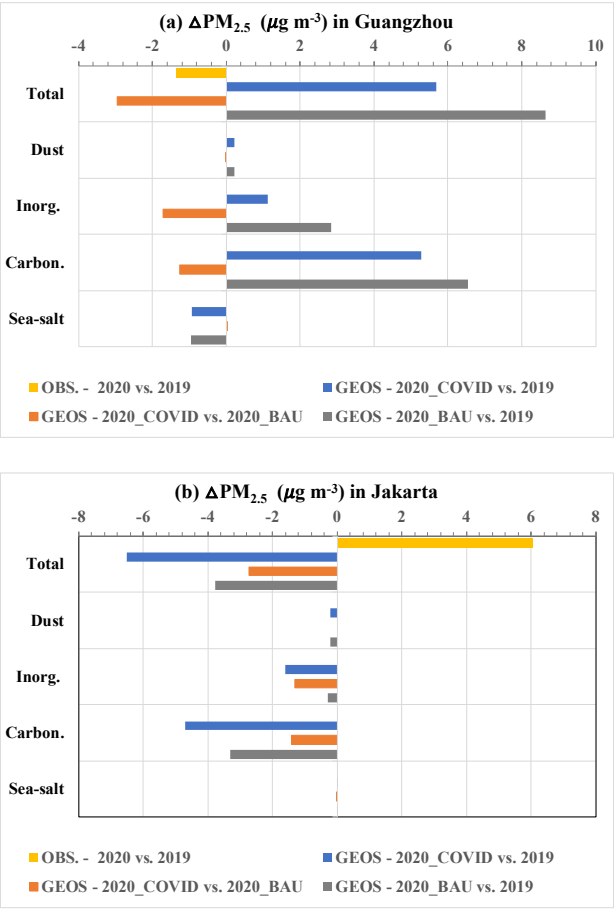

Figure 15: Absolute differences (μg m^{-3}) in March-April average $PM_{2.5}$ between 2020 and 2019 (a negative value indicating that $PM_{2.5}$ was smaller in 2020 than 2019) in Guangzhou, China (a),

and Jakarta, Indonesia (b). Shown here include observed (yellow bars) and GEOS simulated (blue bars) changes in total $PM_{2.5}$. The GEOS simulations are further classified into dust, inorganic aerosol, carbonaceous aerosol, and sea salt, shown below the total $PM_{2.5}$ change. For both total and component $PM_{2.5}$, GEOS simulation is partitioned into GEOS $PM_{2.5}$ change due to anthropogenic emission change (orange) and GEOS $PM_{2.5}$ change due to differing meteorology (gray).

The meteorological analysis could benefit from additional discussion of how specific weather patterns during the lockdown periods might have influenced $PM_{2.5}$ concentrations independently of emission changes.

Response: Thanks for the suggestion. We will analyze several meteorological variables including boundary layer height, winds, precipitation, as well as natural emissions (wildfires, dust, and sea-salt) modulated by meteorology to understand how the weather patterns during the lockdown periods might have influenced $PM_{2.5}$ concentrations.

Review terminology throughout the paper.

Response: We will review carefully to make sure a consistent and appropriate use of terminology. Thanks.

Overall, this is a valuable contribution that effectively leverages the "natural experiment" of COVID-19 lockdowns.