

Interactive comment on “Quantitative assessment of changes in surface particulate matter concentrations over China during the COVID-19 pandemic and their implications for Chinese economic activity” by Hyun Cheol Kim et al.

Anonymous Referee #1

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This paper applies interesting methods that combine atmospheric chemistry transport modelling with surface observations to quantify changes in concentrations and emissions of SO₂, NO_x and PM_{2.5} across (most of) China during the COVID-19 lockdown and the recovery period immediately following coming out of the full lockdown. Simulations were conducted based on both a bottom-up inventory and top-down assimilated emissions. The methods applied need to disentangle the coincidence of the lockdown with the Chinese Lunar New Year holiday (which itself impacts on air pollution levels and has different dates in different years) and the impacts of meteorology, day-of-week,

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and year-on-year trend.

The authors show that SO₂ emissions were little effected during the lockdown, that NO₂ emissions started to recover fairly quickly, but that PM_{2.5} still remained about 30% lower than expected at the end of March. The authors suggest this is due to substantial depression and delays in agricultural activities during and immediately post the lockdown, including reduced dust emissions from tilling, reduced biomass burning particles and some reduced NH₃ emissions. The point is well made that changes in air quality and in emissions from COVID-19 lockdown cannot be generalised from examination of just one pollutant.

The paper is succinctly and clearly presented. The figures are similarly well presented and captioned and plenty of supporting analyses are presented in a comprehensive supplementary information. It is welcome to read a manuscript on the impacts of the pandemic on air quality that applies proper quantitative methods to try and overcome confounding factors on air quality.

A few minor comments:

L43: Surely residential, power generation and industry are all also major sources of NO_x in China, such that transportation is not the majority source in many areas?

L48: Surely for the time duration being investigated here (weeks), meteorologically-driven variation in pollutant concentration is very important, and more important than natural inter-annual variations?

L50: Yes, here the text does refer to meteorological variations so amend the phrasing of the equivalent point a couple of sentences earlier.

L67: State the time period or periods over which the 80% data availability criterion was applied.

Figure 1: Please increase the font size on the figure legend.

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