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Comment of Yin Q et al.: "Measurement report: Long-term variations in surface NOx and SO2 from 2006 to 2016 at a background site in the Yangtze River Delta region, China"

Anonymous Referee #1

Referee comment on "Measurement report: Long-term variations in surface NO_x and SO_2 mixing ratios from 2006 to 2016 at a background site in the Yangtze River Delta region, China" by Qingqing Yin et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-227-RC1, 2021

Review of

Yin Q et al.:

"Measurement report: Long-term variations in surface NOx and SO2 from 2006 to 2016 at a background site in the Yangtze River Delta region, China"

General comments

This paper reports on NOx and SO_2 measurements at the background site in the Yangtse River Delta region in China.

The site, the instrumental setup, quality control and the data processing procedures have been described in detail. Data are compared to other data from other measurement sites. The long-term trend of both SO_2 and NOx, their diurnal and seasonal behavior are discussed and compared to emission data.

There are only few NOx and SO^2 datasets on background sites published and analyzed in depth so far so I would recommend this paper being accepted for publication after the following questions are answered.

Line 85

In the information and methods part, the instrumental setup is described. Here, an essential part is missing. The method to convert NO_2 into NO for detection should be given, as well as the method for determining the conversion efficiency. Has gas phase titration been used? Also, it should be mentioned if data were corrected for humidity and ozone effects.

Line 135

One major concern is that the paper describes trends and seasonal behavior of NOx. However, of the nitrogen oxides, NO_2 has the major impact on health. NO_2 data should be included into table 1 and discussed. What is the long-term trend of NO_2?

Line 167

As the authors point out satellite observations are a valuable tool when analyzing station data. How does the long-term trend of the OMI NO_2 observation compare to the NOx data at the site? Likewise, comparison of in situ observation with station data could help to differentiate between boundary layer effects and emission effects when discussing the diurnal behavior of NOx. How does the diurnal behavior of the satellite observation compare to the diurnal behavior of station data?

Line 207

The pollution roses in Figure 5 show that SO_2 and NOx mixing ratios depend not only on the windspeed but also on the wind direction. Is it possible to add a plot to figure 5 which shows the dependency on wind direction?

Line 220

Changes in relative humidity can often by explained with changes in airmasses which are advected from different sites. How does relative humidity change with wind direction? Can the wind direction explain the change of NOx and SO_2 with changing relative humidity?

Line 237

The authors write that the main source of SO_2 and NOx are east from the site as the show it in figure 7. However, in figure 6 it can be observed that highest mixing ratios were measured with wind coming from west. How can this discrepancy be explained?

Line 305

The diurnal behavior is already discussed in chapter 3.3. I would suggest merging chapter 3.3 with lines 305 to 341.

Line 327

If the disappearance of the NOx peak at 1:00 A.M. were due to reduction of industrial emissions, why should industrial emissions peak at 1:00 A.M.? Shouldn´t the effect be seen all over the night?

Line 337

To my knowledge, the impact of traffic on SO_2 emission in China is of minor importance. Have you considered residential sources, which are after industrial emissions and power plant emissions the third most important source of SO_2 according to the Multi-resolution Emission Inventory for China (MEIC)?

Line 369

Data availability: A link should be provided to where the data are stored in the GAW archive.

Technical corrections:

Title: Measurement report: Long-term variations in surface NOx and SO2

from 2006 to 2016 at a background site in the Yangtze River Delta

region, China

Better:

Title: Measurement report: Long-term variations in surface NOx and SO2 mixing ratios

from 2006 to 2016 at a background site in the Yangtze River Delta

region, China

Line 185: The seasonal average diurnal variation in NOX showed a morning peak of NOX in summer at 08:00, which is 1 to 2 h earlier than during other seasons (Fig. 4c).

This sentence is not clear to me. What is it compared to?

Line 221: different periods are well consistent

Line 222: A blank is missing

Line 250: Please give a reference for the Ecological and Environmental Status Bulletin.

Line 254: smaller than those

Figure 5: The dependencies of SO_2 on meteorological parameters in the figure is blurred from the underlying trend. In figure 5h it cannot be seen if data for 2014-2016 change at all. Maybe it is better to plot changes relative to a mean value.

Figure 6: I would suggest using the same color for NOx in all the seasons in this plot and label the plots instead.

Figure 11: The different y scales in Figures 11a to Figures 11c makes comparison between the periods difficult. I would suggest using the same scale.

Figure 11: I would suggest naming the periods in the figure caption.