

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-1089

Anonymous Referee #1

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Referee comment on "Spaceborne tropospheric nitrogen dioxide (NO<sub>2</sub>) observations from 2005–2020 over the Yangtze River Delta (YRD), China: variabilities, implications, and drivers" by Hao Yin et al., Atmos. Chem. Phys. Discuss.,  
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This manuscript investigates the long-term variabilities of tropospheric NO<sub>2</sub> VCDs from 2005–2020 using OMI satellite data product over the Yangtze River Delta (YRD), one of the most densely populated and highly industrialized city clusters in China. The authors also quantify the contributions of meteorology and anthropogenic emissions to the long-term variabilities of tropospheric NO<sub>2</sub> VCDs in the major megacities over YRD. They conclude that the inter-annual variabilities of tropospheric NO<sub>2</sub> VCDs from 2005 to 2020 over the YRD can be divided into two stages, i.e., an overall increasing trend from 2005 to 2011 and an overall decreasing trend from 2011 to 2020. This is an interesting study and the majority of the work are creative. This manuscript is well written, structured and analyzed convincingly, and its topic fits well within the scope of ACP. I think that this manuscript can improve our knowledge with respect to long-term evolutions of economic and social development, anthropogenic emission over the YRD, and could be of interest to the general atmospheric science community. Minor revisions are recommended.

General comments:

- Please provide more detailed descriptions about the YRD region, such as the population, number of cities, area of the region, etc, over Zhejiang, Anhui and Jiangsu Province. This would help the reader understand the reason that YRD region is one of the most densely populated and highly industrialized city clusters in China.
- In section 3.3 and Figure 5, the authors state that "For each city, the CNMEC ground level NO<sub>2</sub> measurements nearest to the OMI ground grid were included for comparison." In each city, there are a number of CNMEC ground stations. However, the authors present comparisons of satellite and ground-based observations for each city. Whether the authors averaged all observed values or some other method? The authors should state the detailed of this process in section 6.

Detailed comments:

- The phrase “tropospheric NO<sub>2</sub> VCDs” is too cumbersome in this manuscript, and please change it to a simple symbol, such as “Tro\_NO<sub>2</sub>” or similar.
- Please include a figure about the monthly average of surface temperature in main cities over YRD in the supplement, same as figure S6.
- Line 37, “... inter annual ...” should be “... inter-annual ...”.
- Line 41, “... which cause ...” should be “... which causes ...”.
- Line 58, “... biogeochemical reaction ...” should be “... the biogeochemical reactions ...”
- Line 85, “the rapid developing regions” should be “the rapidly developing regions”.
- Line 102, “policies” should be “policies”.
- Line 259, “Except ...” should be “Except for ...”.
- Line 346, “agreements” should be “agreement”.
- Line 352, “characterized” should be “is characterized”
- Line 395, “bellow” should be “below”.
- Line 465, “relative” should be “relatively”.
- The usage of “emission” and “emissions” is sometimes misleading, please use it consistently.
- Please add the units for each meteorological parameter in table 2.
- I cannot list all technical errors as above. I thus suggest that the authors should check all grammatical errors throughout the manuscript and correct accordingly.
- Please check the format of each reference and make sure it follows the ACP format.