

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2021-103

Anonymous Referee #2

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Referee comment on "Spatial and temporal variations of CO<sub>2</sub> mole fractions observed at Beijing, Xianghe, and Xinglong in North China" by Yang Yang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-103-RC2>, 2021

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This is an important and valuable data to assess temporal and spatial variations of CO<sub>2</sub> in North China. However, this data must be further discussed in order to support the main reasons of those CO<sub>2</sub> variations. Comparisons with other megacities will be a good approach to improve the discussions. Follow specific suggestions to help the authors improve descriptions and discussions of the manuscript:

Section 2.2.2: Further description of calibration and data processing:

- 1) How CRDS stability was checked over time, before and after malfunctions?
- 2) Describe the steps used during data processing; what kind of filters were used?

P5 – lines 101-102: Data filtering were not used to reduce uncertainties but to exclude no-valid data. Review this sentence.

Results and discussion

Section 3.1 time series: Strategies/methods to selection of background mole fractions must be further presented and discussed in order to show low influence of anthropogenic sources.

P7 - lines 138-144 : Please add mean (std) concentrations related to higher and low CO<sub>2</sub> levels.

P7 – lines 149-150: Contribution of main sources (fossil fuel and heating) must be further discussed. Other sources as biomass burning from wildfires are important? If possible, trace gases/species would be used to identify activity of specific sources.

P9 – lines 166-167: Discuss the reasons of higher amplitudes in BJ.

P9 – lines 216-217: References must be added to support the assumption.

Section 3.4: Is important discuss CO<sub>2</sub> variations with the wind direction based on local and remote sources.

Section 3.5: Reasons to CO<sub>2</sub> mole fractions variations in L1 and L2 altitudes must be discussed.

Section 3.6: This section must be further assessed using different approaches. One of these strategies would be investigate seasonal differences during weekday-weekend.

P13 – line 255: Assumption of lowest anthropogenic emissions on Tuesday must be proven.