

Interactive comment on “Measurement report: Long-term variations in carbon monoxide at a background station in China’s Yangtze River Delta region” by Yijing Chen et al.

Anonymous Referee #2

Received and published: 4 September 2020

The manuscript presents an extensive overview of the long-term CO measurements at Lin’an in the Yangtze River Delta of China. The data cover 12 years and provide important information for the community to understand the changes and mechanisms in Chinese air pollution and its relationship with emissions, chemistry and meteorology. The data are valuable, and the analysis and writing is overall well done for a “Measurement Report”. I recommend publication after the following issues are addressed.

The manuscript shows the variabilities/trends of CO at a variety of time scales of interest to scientists and policymakers. It would be very interesting and useful to compare the observed variabilities to emissions (both anthropogenic and natural) and to MO-

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PITT data. Comparisons with emissions would reveal consistency and inconsistency between emissions and measured concentrations, and would offer insight into current limitations and strengths in emission data. At the present form, fire emissions are used to investigate the seasonality, and anthropogenic emissions are used to discuss the trends. These are very interesting, but examining other time scales would be insightful as well.

Also, comparison with MOPITT data at all time scales (in addition to trends) would provide further insight to the characteristics of CO over China and the representativeness of Lin’an measurements. For example, the trends in MOPITT agree in sign with that of Lin’an data, but to what extent is the two trends consistent quantitatively, and what are the implications of this consistency/inconsistency?

Diurnal cycle: the PBL mixing would be an important factor affecting the diurnal cycle. Could you show PBLH or other indicator of mixing (e.g., from assimilation data)? Also, there appears to be some phase shift in the peak mixing ratio between different sites. Could you comment on this?

Interannual variability: The variability is very large for CO mixing ratios, which may be related to meteorology and/or chemistry. Could you comment on this? What does this variability mean when relating CO concentrations to emissions? To what extent is the trend of CO consistent with those of emissions, quantitatively? And why?

Please define alpha for the first time (I assume it is the P-value). Also, why is alpha always equal to 0.05 throughout the text? Do you mean $\alpha < 0.05$? Specifying the actual value of alpha would be better, given that the often mis-interpretation of the P-value, as discussed extensively in recent years.

Fig. 6. The choice of the three periods seems to be arbitrary – it is not obvious why the years can be grouped into these three periods. Could you show Lorenz curves year by year?

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Fig. 8. There appears to be some non-zero trend in the 5% percentile data. Could you show the trend and discuss this in the context of the large-scale CO trend (e.g., shown in the literature)?

Fig. 9. The value in 2011 is also very low. Could you explain this?

Fig. 10. The analysis for Fig. 10 appears speculative. The apparent relationships are a result of processes at a variety of time scales, which render determinative explanations difficult. Also, the met fields used are correlated to each other, affecting the explanations specific to each met field.

Specific comments: L169, should be 12 years L526. “those” should read “than those” Table 1. The mixing ratio at Shangdianzi appears very low in 2011-2017. Could you check this? Fig. 3b. Do you mean the number of fire spots here? Fig. 5. Is the standard deviation calculated from monthly means? Fig. 7. Is weighting factors based on standard deviation of monthly mean values? Please clarify. Fig. 10 and Table 2. Please specify the intervals of each met field.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-610>, 2020.