Review of the manuscript: "Observational Insights into Atmospheric CO2 and CO at the Urban Canopy Layer Top in Metropolitan Shanghai, China" by Shuang Fu et al. submitted to Atmospheric Chemistry and Physics (ACP).

The paper provides a detailed analysis of CO2 and CO measurements taken over a two-year period at the top of the Shanghai Tower. The originality of the study lies in the unique height (632m)at which the measurements were taken, in the heart of a city. The article also makes interesting use of measurements of other tracers taken at an air quality station at the foot of the tower. The procedure for estimating background signals and concentration excesses associated with regional activities is clearly explained and well suited to the specific conditions of the measurement site at the top of the building. Overall, the results obtained are consistent with the expected processes, particularly in relation to a two-month lockdown period. I therefore recommend publication of the article in the ACP journal, after correction of certain inaccuracies and a few revisions. Please note that several figure captions are incomplete.

My main comments are as follows:

Line 49: "*…with cities responsible for ~85% of its carbon emissions*" : Is it really 85% of emissions that occur in cities, or is it rather the carbon footprint of cities? Please clarify.

Line 51 : "*China has been deploying an extensive urban and suburban carbon monitoring network*" : Is it possible to know how extensive this measurement network is ? How many cities, or monitoring stations ?

Line 121: "*The manufacturer reported a measurement precision (1σ over 5 min) of approximately 50 ppb for CO2 and 1 ppb for CO, with accuracy meeting WMO/GAW compatibility goals.*" : Rather than having the manufacturer's specifications, I would prefer to have the measurement precision and repeatability estimated from regular measurements of the target gas. Could you please show the time series of the target gas measurements. Please also specify the frequency of calibration sequences, and indicate which method is used to dry the air.

Figure 2: Over the two-year measurement period, there is a significant amount of missing data. This is one of the difficulties involved in maintaining observations, and it would be interesting to know the reasons for the main data gaps. Could you please provide some description of the difficulties you encountered, and why the monitoring program has been discontinued ?

Figure 2: Also the CO concentrations measured at SHT in winter 2022 are higher than the previous winter, which is not seen in ground based measurements of CO, NO2, SO2. Do you have any explanation on this year to year wintertime variability which doesn't seem to be related to the local surface emissions ?

Section 3.4: The value used as the CO2/CO ratio is not very clear to me. Do you use the average value for the entire measurement period? This ratio $k_{CO2/CO}$, derived from atmospheric observations, corresponds to the total CO2 signal (ff and bio combined), and therefore, in my opinion, the justification for using it to deduce the CO2ff fraction is not sufficiently explained.

Section 3.5: Most of the variations described during and after the spring 2022 lockdown appear consistent and are well explained. There are still a few points that need to be discussed:

- "*…with limited disruption to industrial operations. This explains why ground-level SO_2 (largely tied to industrial activities) rose 6.3–153.6%*": At this level of increase, it seems more likely that there has been an increase in industrial activity. Is this conceivable? At the same time there is a sharp increase of CO_{gl} despite the decrease of traffic (as indicated by the sharp decrease of NO_2). What is the possible driving force for this increase of CO ?

- The increase in CO and CO2 concentrations is also striking when measurements resume in September 2022, both when using all measurements, or only background measurements. Therefore, it seems a bit difficult to reconcile the huge increase of the background signal at SHT compare to the regional DMS background station (a signal which was not seen in 2021), with the stability or decrease of CO at the surface level in Shangai.

Minor comments :

Line 55: "*To extract regionally representative data with minimal emission influence"*: I suggest to mention "Local' emission

2.1.2. *Additional Environmental Data* : can you please provide the elevation a.g.l. of the two air quality & meteorological stations ? I guess they are very close to the ground.

Figure 2: are the PBLH given on hourly basis, day and night ?

Figure 4: could you also locate the DMS site on the maps, or at least could you precise how far it is from SHT tower ?

Figure 5: In my opinion, the best practice for these wind rose figures is to use detrended and de-seasonalized dataset.

Figure 7b: there is no explanation about the dashed red line