Anonymous Referee #1

This manuscript is well written. I recommend it be published with a few minor edits.

We thank the reviewer for their positive comments and suggestions. Please find below our replies and the related modifications to the manuscript. The page and line numbers refer to the version of the manuscript published on ACPD.

Section 2.2: Go into more depth how the footprints and the emissions inventory are combined to obtain atmospheric concentrations of CO.

The text below has been added to the section 2.2 (P5, l3):

"To do this, first we derive the sensitivities of the measured air masses to emissions occurring within a grid cell (units [gm^{-3}] / [$gm^{-2}s^{-1}$], i.e. sm^{-1}) and then by multiplying the sensitivities with the emissions from the emission inventories we are able to calculate the modelled CO concentration (dimensionally, $sm^{-1} \times gm^{-2}s^{-1} = gm^{-3}$). To convert the concertation to a volume mixing ratio we divide the modelled concentrations by the molar mass, divide again by the air density and multiply by 1×10^9."

Figure 4: Black box referred to in caption is not visible.

Figure 4 "black box" – that was a mistake in the caption. Caption for Figure 4 (P5) corrected to say: "Figure 4: The blue box represents the regional contributions from outside Beijing and the red box is the Beijing region. The map also shows the 2010 population census (people per pixel – WorldPop data)"

Page 6, line 10: change the time resolution of 1 Hz to an actual time resolution (in hours, minutes, or seconds).

The time resolution has been changed (P5, l10): to 1 second.

Section 2.3: State how the CNEMC CO and PM2.5 measurements are used in this study.

Text was added at P6, l7 stating how the CNEMC data was used.

"In this study, we use the data collected at the IAP meteorological tower (Shi et al., 2019) to validate the modelled CO data and the CNEMC datasets to compare with our modelled CO from 2013 – 2016 and determine the pollution events in Beijing using the PM2.5 measurements. "

Table 2: Add a row for "All sectors regional" and another for "All sectors Beijing"

Added the 2 rows at the end of Table 2 (P9) as suggested

Page 9, lines 14-15; page 9, line 17; page 10, lines 2-3: I assume the concentrations stated here are from the footprint + EI analysis. Explicitly state this.

Text was added at the beginning of the paragraph at P9, l12 to explicitly say:

"Further analysis was conducted to determine the contributions from each emission sector within Beijing and outside of Beijing using the modelled CO derived from the analysis of 5 day backwards footprints and the emission inventories."

Figure 10 caption: change "south for each case study" to "south for three case studies" and include the time frame for 10d.

Corrected. Caption for Figure 10 (P12) now says: "Figure 10: a) b) c) Time series of the measured CO, modelled CO transported to Beijing from other regions and the % of air masses arriving at Beijing from the south for three

case study, and d) is the frequency distribution and average $PM_{2.5}$ for each classifications when $PM_{2.5}$ concentration is over 75 μg m^{-3} during 2013-2016"

Page 13, line 20: change "total modelled" to "5 day modelled"

Corrected

Page 14, line 6: change "but didn't classified" to "but weren't classified"

Corrected

Figure 11 caption: Don't know what "the points representing the time where PM2.5 concentration was over 75ug/m3" are? Don't see any points.

Corrected. The new caption for Figure 11 (P14) states: "Time series of the measured CO at the IAP in the winter APHH campaign, during the five haze events where $PM_{2.5}$ concentration was over 75 μg m^{-3}. The colours represent the three classifications observed during the five haze episodes identified in Shi et al., 2019 "

Page 14, line 15: change "explain well variations" to "explain variations"

Corrected

Page 15, line 19: change "Volatile" to "volatile"

Corrected