This study combined the HYSPLIT ensemble with CWT to obtain hourly resolution of pollutant sources and employed machine learning method to quantify the contributions of local emissions and regional transport in Beijing. The article highlights that local emissions were the main cause of pollution events in Beijing from 2013 to 2020 and that the Air Pollution Prevention and Control Action Plan had a more significant effect on reducing emissions through regional transmission. After addressing the following comments, I believe this work has excellent potential for publication.

General Comments

1. Line 43: "was gradually increasing"

2. Line 44: "contributors to"

3. Line 122-127: Compared to previous studies that relied solely on CWT analysis with HYSPLIT trajectories to distinguish between local emissions and regional transport, what specific improvements does your study introduce? In other words, after integrating XGBoost models, what are the advantages of your approach in enhancing the analysis? What specific problems or limitations of the previous methods does your study address? These aspects should be clearly articulated to highlight the improvements and contributions of your work.

4. Line 142: "which are available every 3 hours."

5. Lines 148 to 160: There is an issue with the formula used to calculate the potential source region airflow trajectory weight concentration using CWT. C_{ij} represents the average weight concentration of the ij-th grid, and W_{ij} is the weight coefficient of grid (i,j) used to reduce uncertainty. Therefore, there is no need to multiply by W_{ij} when calculating C_{ij}; multiplying by W_{ij} is for calculating WCWT.

6. Line 177-180: The authors employed the XGBoost model to predict $PM_{2.5}$ concentrations, using only meteorological, temporal variables and PBLH as input parameters. Considering that the data in this study were obtained from national monitoring stations, which typically provide detailed information on conventional pollutants (e.g., PM_{10}, SO_2, NO_x, O_3, CO), would the exclusion of these pollutant data from the model input impact the model's performance?

7. Line 185-195: I'm very interested in how the authors used the XGBoost model to separate local $PM_{2.5}$ from ambient $PM_{2.5}$, as this could be incredibly valuable for work in this field. However, the explanation in this section lacks sufficient detail on how this was achieved. I

believe other readers might have similar questions. It would be both helpful and necessary if the authors could provide more detailed and clear explanations to make the paper easier to understand and more applicable.

8. Line 215: The sentence "Fig. S2 reveals that ambient pollution events ($PM_{2.5}$>75 µg m^{-3}) in Beijing are primarily influenced by air masses originating from the south and west, particularly under the control of westward air masses." It merely presents the observed phenomenon that ambient pollution events in Beijing are mainly affected by air masses from the south and west, especially under the influence of westward air masses, but fails to provide in-depth analysis or explanation for why the westward air masses have a stronger influence in certain circumstances. It lacks speculation or reference to relevant studies to enhance the understanding of the underlying reasons for this phenomenon.

9. Line 303: "from the south region"

10. Why does the manuscript divide the year into four seasons (spring, summer, autumn, and winter) instead of four quarters? The commonly understood seasons have time differences, and given the long-time span of this study, this could introduce some error. The study needs to clearly define how spring, summer, autumn, and winter are defined each year.

11. Based on the CWT combined with the HYSPLIT ensemble, the authors distinguished between local emissions and regional transport. However, in the subsequent machine learning process, the authors used XGBoost to derive locally emitted $PM_{2.5}$ and then derived the regionally transported $PM_{2.5}$. Why choose this approach instead of learning regional transmission to calculate local emissions? Please explain the reasoning.