Review of Manuscript Entitled: **Assessing the influence of long-range transport of aerosols on the PM2.5 chemical composition and concentration in the Aburrá Valley**

General comments:

The manuscript presents the results of utilizing multiple tools, from in-situ PM2.5 chemical speciation data, source-receptor models, and back trajectory analysis, to estimate the monthly contribution of LRT to PM2.5 concentration in the Aburrá Valley, in Colombia. Furthermore, a careful characterization of the prevailing meteorological conditions during LRT events from Biomass Burning, Dust, and Volcanic degassing where also shown in the manuscript.

The manuscript is well written (some minor comments below) and advances the current understanding of the contribution of regional an global sources of PM2.5 in the Northern South American region. Particularly, the study points to the relevance of volcanic degassing for the region, an often overlooked source of aerosols, which is shown by the authors to be significant during LRT events.

The figures shown in the manuscript are of great quality.

As an overall recommendation, I would invite the authors to focus less on the importance of their findings for the AV, and rather focus on discussing the broader implications of their work for the region. That could be achieved with relatively ease but would require re-writing some specific parts of the document.

I recommend the manuscript to be published after addressing these minor comments.

Specific comments:

L10. “During these LRT events, the BB fraction of PM2.5 dominates by frequency and amount, averaging 11.14 µg/m3 (38%). On average, dust and volcanic degassing contribute 6.77 µg/m3 (34%) and 6.46 µg/m3 (30%) of the concentrations.” This phrase might be confusing, specially the second part. What the authors really mean is that averaging over LRT events, dust and volcanic degassing contribute 34% and 30% of PM2.5? Is that the total? Something should be said in the abstract to at least provide the reader with an idea of the observed frequency of LRT events, or its typical duration (so those other numbers could be better contextualized).

L12. “Of the three, dust events showed fewer affected days.” I would consider rewriting.

L63. “In Colombia, the Aburrá Valley (AV) has made substantial progress in monitoring and identifying agents of the state of air quality in the territory, managing to report significant affectation driven by external sources (SIATA, 2021).” Consider re-writing or removing altogether.

L64 “In the territory, as on the national scale” To which territory do the authors refer to? Please, consider removing or rewriting.

L65. There are at least 2 relevant studies in the region that could possibly enrich the discussion in the introduction:

- https://doi.org/10.1016/j.atmosenv.2019.01.051 which demonstrate the high concentration of PM2.5 and ozone in the Orinoco river basin during high BB seasons.
- https://doi.org/10.5194/acp-20-7459-2020 which shows the correlation of BB tracers with regional biomass burning activity.

L71. “To the AV, obtaining the …” Consider removing “To the AV”.

L90. It would be useful to qualify this statement with data. For example, how many daily exceedances were observed in a given year? Or what is the annual mean PM2.5 concentration in the AV?

L107. “However, the sampling in this later period was typically between 3 to 14 days. Therefore, while the temporal sampling resolution did decrease with time, we still have periods of intense sampling and measurements across the majority of the period.” Please rephrase as it is confusing.

L123. “Official campaign concentrations of PM2.5 were measured by a Low Volume PM2.5 ambient air sampler”. Could the authors clarify this statement? What are “official” concentrations? How do the Low-vol concentrations differ from the High-volume sampler derived concentrations? Where the latter concentrations not determined at all? Please clarify and correct the manuscript accordingly.

L125. “In addition to the carbonaceous matter, species measured included secondary organic carbon”. Please re-write for clarity. SOC was not measured, but it was inferred from the measurements.

L150. “mean absolute percentage error of 21.5%”. Is this 21.5 percent overestimation relative to the MED-BEME station? Or 21% underestimation?

L187. “Here, if less than four days with values greater than the specified threshold were detected, then they were classed as outliers and removed (i.e., we are focusing on LRT events, which we define as lasting more than half a week”. This is a key point in the manuscript and one that should be subject to a more specific description. Why focus on 4-day events? Dust events from LRT can impact a given location for a single day but contribute over 90% of PM2.5 to that given location on that day. If the decision is due to the sparsity of PM2.5 samples, then it should be clearly stated.

Figure 4. Caption and legend could be improved. No mention is made of the PM2.5 variable there. Is it monthly PM2.5 for the site? Or is ir PM2.5 attributable to LRT events? Similarly, the “All events” bar, which is black, it is not clear if there were any LRT events in which the three sources were impacting the site simultaneously.

L315. Seasonality?

L315. “some non-event days in the different months occur” ?? Please, consider re-writing for clarity.

L353. “On the other hand, the concentration of PM2.5 right after Volcanic-LRT significantly decreases” …. This assertion is hard to see from Figure 7c.

L442. “The lower TCSO2 threshold derived in this study is likely linked to the CAMS product we used”. It is also possible that using SO2 observations (if available from the monitoring network) for the Volcanic-LRT events could help.