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Comment on acp-2021-739

Anonymous Referee #2

Referee comment on "Why is the city's responsibility for its air pollution often underestimated? A focus on $PM_{2.5}$" by Philippe Thunis et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-739-RC2, 2021

The manuscript sent by the authors is entitled with a remarkable question. Then, the authors present a methodological approach to address Source Appointment, proposing nomenclature to harmonize future studies. The authors then applied their methodologies to the results of models SHERPA and EMEP, to answer the question of the title. The manuscript is well written and brings to the table that air pollution is an environmental and complex problem, which requires local and regional/global solutions and ideas. However, I feel that there are some issues that need to be addressed by the authors:

Main:

The authors are too ambiguous when they are answering the question of the title. The results of the responsibility in core cities is lower than FUA regions, with values from around 20%, but higher in other cities and periods of time. Then, I think the authors could propose a threshold value to emphasize when the city is responsible for their air pollution or not, and when. Can be this generalized by season? Are the cities responsible for dry and cold days? What about on under a windy pattern? Clarifying these issues in an explicit way would clarify the answer to the main question.

"emission inventories are easily seen as the scapegoat if a mismatch is found between modelled and observed concentrations of air pollutants" (Pulles and Heslinga, 2010). Between lines 481 and 487, the authors mention the uncertainty of emissions inventories, citing residential emissions and resuspension of particles, which is very good. However, the authors do not mention anything about the uncertainty of numerical modelling of meteorology. How was the wind speed? Are situations of wind speed higher than observations? This might result in lower air pollutant concentrations. Furthermore, how is generally PBL numerically represented in Europe by the meteorological models used in the EMEP/SHERPA database? Please, discuss.

Minor:

In the abstract, lines 533 and 633 the authors mentioned "the impact of spatial averaging leads to an average factor of 2 difference in city responsible". I suggest rephrasing these sentences in a more explicitly way.

Lines 256 and 590. This paragraph consists of only one sentence. Please merge with another paragraph.

Lines 320-324. I was really glad that the authors mentioned particles emissions from electric vehicles

Lines 422 to 424. Why it is interesting?