Comparing vehicular emissions inventories in Brazil

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INTRODUCTION

Vehicular emissions are one of the most important sources of atmospheric pollution in urban areas. Exposure to air pollution from traffic is a critical public health concern due to its association with several adverse health effects. Therefore, it is crucial to determine the amount and spatial distribution of vehicular emissions at high spatial resolution to help environmental planners find hotspots in specific areas.

Aim of the study: comparison the spatial distribution of two vehicular emissions inventories in Brazil.

METHODOLOGY

STUDY AREA

- Metropolitan Area of São Paulo (MASP) – Brazil
  - 39 municipalities
  - 0.65 vehicles/inhabitants
- Metropolitan Area of Curitiba (MAC) – Brazil
  - 19 municipalities
  - 0.75 vehicles/inhabitants

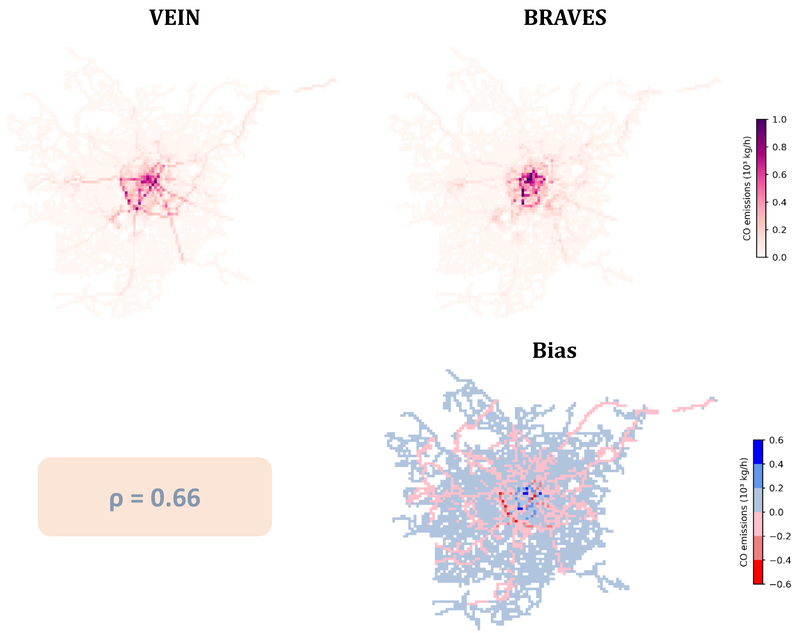
VEHICULAR EMISSION INVENTORIES

- Vehicular Emissions Inventory – VEIN[1]
  - Bottom- up approach
  - Vehicular emissions by street
- BRAzilian Vehicular Emissions inventory Software - BRAVES[2]
  - Top-down approach
  - Disaggregates vehicular emissions by cell

SPATIAL RESOLUTION

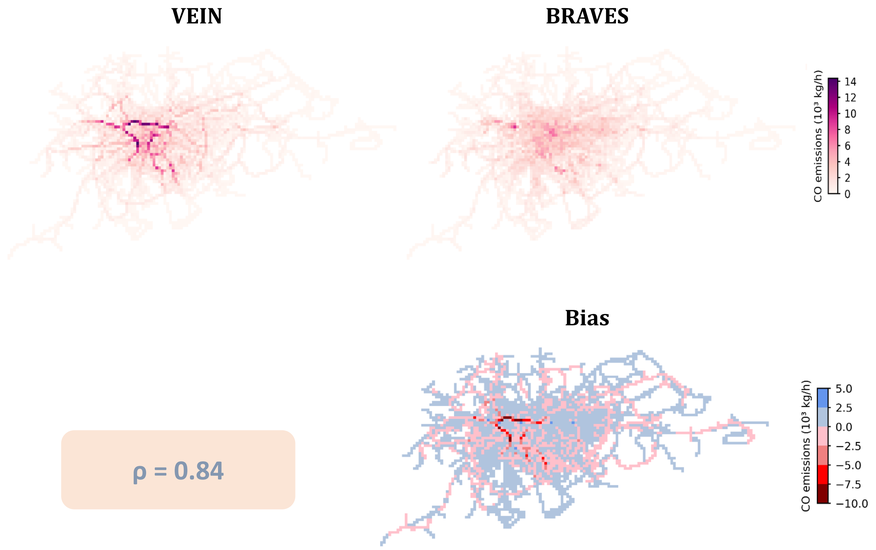
- 1x1km

RESULTS: MAC



ρ = 0.66

RESULTS: MASP



ρ = 0.84

CONCLUSION

- Overall, VEIN and BRAVES spatial distribution of vehicular emissions are similar and well correlated in both study areas (MASP and MAC), with Spearman correlation of 0.84 and 0.66, respectively;
- BRAVES presented similar hotspots in the central area of MAC compared with VEIN hotspots;
- BRAVES was not able to allocate hotspots in the central area of MASP as represented by VEIN;
- BRAVES showed different hotspots in MASP with lower emissions.

REFERENCES

[1] Ibarra-Espinosa, S., Ynoue, R., O'sullivan, S., Pebesma, E., De Fátima Andrade, M., Osses, M., 2018. VEIN v0.2.2: an R package for bottom-up vehicular emissions inventories. Geosci Model Dev 11. https://doi.org/10.5194/gmd-11-2209-2018

[2] Hoinaski, L., Vasques, T.V., Ribeiro, C.B., Meotti, B., 2022. Multispecies and high-spatiotemporal-resolution database of vehicular emissions in Brazil. Earth Syst Sci Data 14, 2939–2949. https://doi.org/10.5194/essd-14-2939-2022.

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