Recommendations for source apportionment techniques for ultrafine particles

Meritxell Garcia-Marlès[1,2], Andrés Alastuey[1], Xavier Querol[1], and the RI-URBANS UFP team

[1] Institute of Environmental Assessment and Water Research (IDAEA-CSIC), Barcelona, Spain

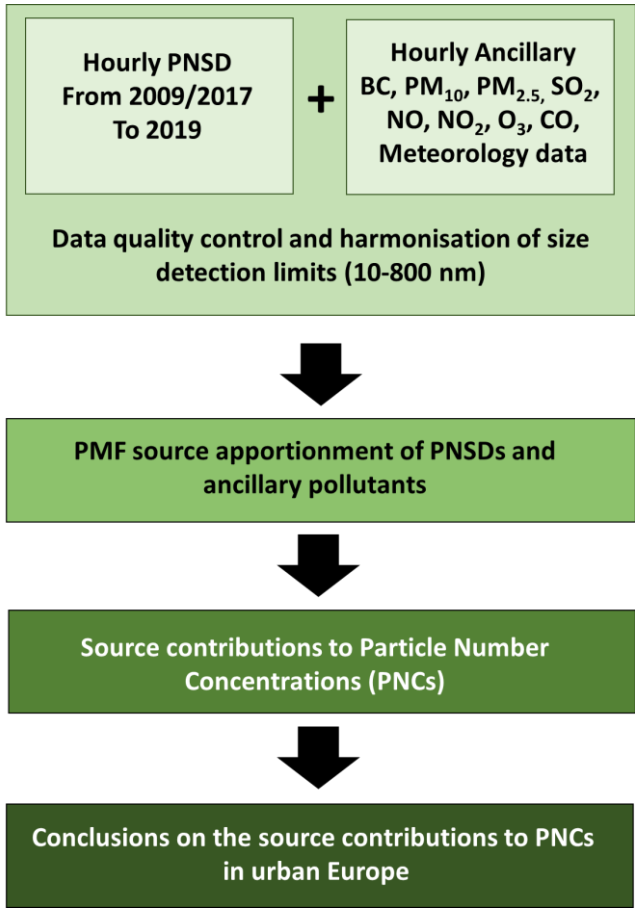
[2] Department of Applied Physics-Meteorology, University of Barcelona, Barcelona, Spain

RI-URBANS (101036245)

Final Science Meeting (8-9 September, 2025)

Methodology: ST11

- Particle number size distribution (PNSD): ≤ 10 nm
- Positive Matrix Factorization (PMF):
  - EPA-PMF for datasets < 3 years
  - Hopke et al. (2023) tool using multilinear engine 2 (ME-2) for larger datasets
- PNSD uncertainty estimation: Ogulei et al. (2007)
- Evaluation of displacement (DISP) results
- Nucleation factor splitting: Rivas et al. (2019)



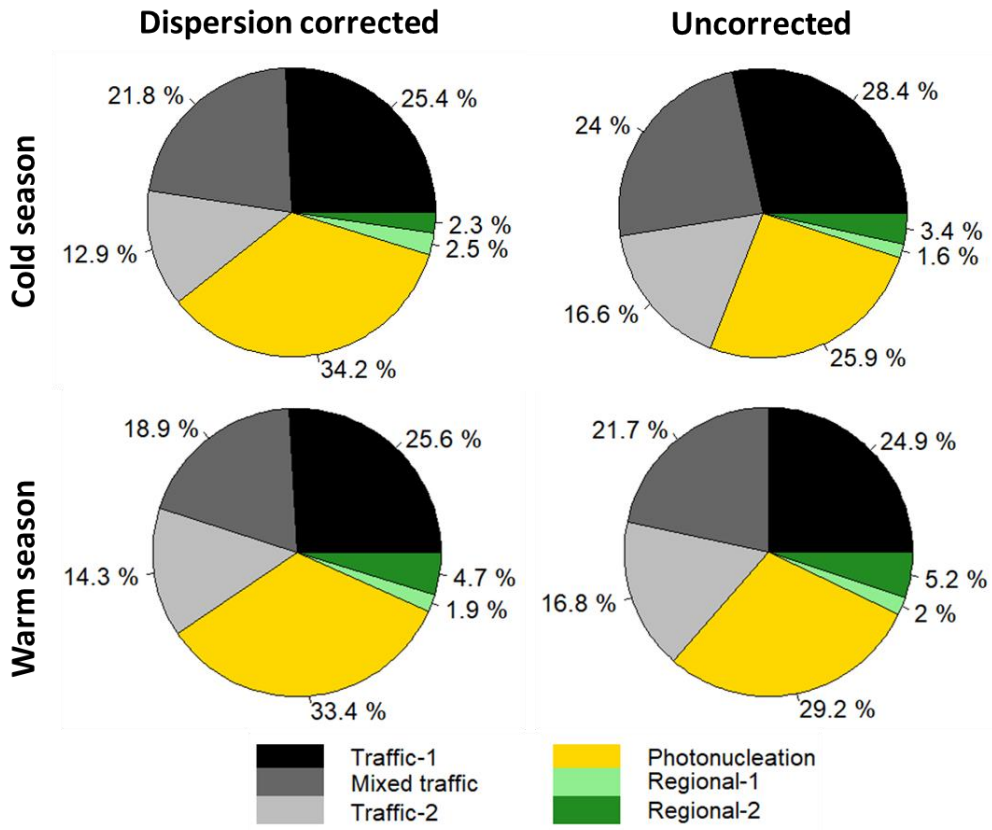
From Garcia-Marlès et al. (2024)

Dispersion correction

- Dispersion normalisation by ventilation coefficient (VC):

  VC = BLH x WS

  (Boundary Layer Height; Wind Speed)
- If dispersion is not considered:
  - Local sources overestimated
  - Photonucleation underestimated (dilution by stronger midday VC)



Barcelona 2013-2024 source apportionment results, adapted from Garcia-Marlès et al. (2025, submitted)

Conclusions and recommendations

- Dispersion correction improves comparability
- Results align with chemical transport models (CTM):
  - Traffic overestimated
  - Photonucleation underestimated
- Applications:
  - Emission control policies: use dispersion-corrected data
  - Health studies: use uncorrected data (reflects actual exposure)