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Spatial and temporal variability of carbonaceous aerosols: Assessing the impact of biomass burning in the urban environment

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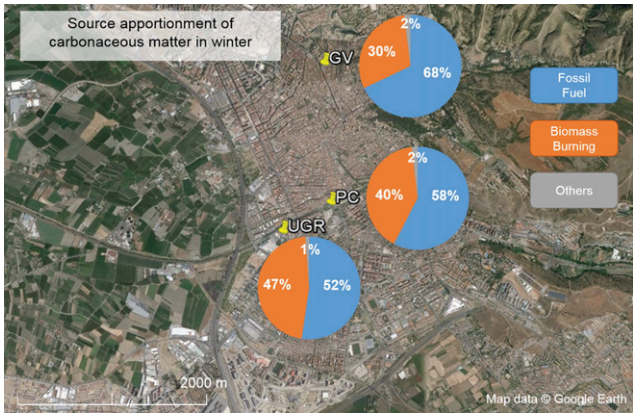
HIGHLIGHTS

- Biomass burning impact in southern Europe urban air quality sparsely investigated.
- Levoglucosan tracer and online real-time Aethalometer methods have been applied.
- High contribution of biomass burning during winter in the suburban area.
- Lower contribution of biomass burning in the city center.

GRAPHICAL ABSTRACT



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ABSTRACT

Biomass burning (BB) is a significant source of atmospheric particles in many parts of the world. Whereas many studies have demonstrated the importance of BB emissions in central and northern Europe, especially in rural areas, its impact in urban air quality of southern European countries has been sparsely investigated. In this study, highly time resolved multi-wavelength absorption coefficients together with levoglucosan (BB tracer) mass concentrations were combined to apportion carbonaceous aerosol sources. The Aethalometer model takes advantage of the different spectral behavior of BB and fossil fuel (FF) combustion aerosols. The model was found to be more sensitive to the assumed value of the aerosol Ångström exponent (AAE) for FF (AAE_{ff}) than to the AAE for BB (AAE_{bb}). As result of various sensitivity tests the model was optimized with $AAE_{ff} = 1.1$ and $AAE_{bb} = 2$. The Aethalometer model and levoglucosan tracer estimates were in good agreement. The Aethalometer model was further applied to data from three sites in Granada urban area to evaluate the spatial variation of CM_{ff} and CM_{bb} (carbonaceous matter from FF or BB origin, respectively) concentrations within the city. The results showed that CM_{bb} was lower in the city centre while it has an unexpected profound impact

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