Carbon and nitrogen stable isotope composition for particulate matter source apportionment in Tarragona - Spain

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In the framework of the UltraPAR project, the outdoor airborne particulate matter equal or smaller than 10, 2.5, and 1 μm (PM_{10}, $PM_{2.5}$, and PM_1, respectively) from 14 schools located in the city of Tarragona and its vicinity (Catalonia, Spain) was sampled in winter 2016-2017 and summer 2017 for assessing the contribution and seasonality of different emission sources. Moreover, 9 samples from different local potential sources (i.e. a harbour, two industrial complexes and a municipal waste incinerator) were obtained.

All these samples were chemically characterized for major and trace elements and main soluble ions. Organic and elemental carbon were estimated according to Alastuey et al. [1]. In a first approach, the source apportionment was explained by means of these classical chemical parameters into the following categories: Traffic, Industrial, Marine and Crustal, as done by Querol et al. [2]. Significant differences between winter and summer were noted.

Secondly, a separate evaluation coupling carbon and nitrogen stable isotope composition to their corresponding C and N total contents following Morera-Gómez et al. [3], permitted a more detailed discrimination of combustion and marine type sources. Additionally, following Sharma et al. [4], a review of back trajectories for air masses (through US NOAA HYSPLIT model) together with PM_1 isotopic composition confirmed some long-distance potential sources.

Finally, a dual isotope plot of C and N allowed us to propose an end-member mixing model to improve the source apportionment in Tarragona. Temporal and spatial variations were analysed.

[1] Alastuey et al. (2007) Atmospheric Environment 41 6366–6378 [2] Querol et al. (2004) Aerosol Science 35 1151–1172 [3] Morera-Gómez et al. (2018) Science of the Total Environment 642 723–732 [4] Sharma et al. (2015) Bull Environ Contam Toxicol 95:661–669