EGU24-7808, updated on 05 Mar 2025
https://doi.org/10.5194/egusphere-egu24-7808
EGU General Assembly 2024

Multiple lines of evidence help identify the sources of Nitrogen and Carbon in particulate matter sampled in the historical center of Naples (Italy)

Mauro Rubino[1], Carmina Sirignano[2,1], Elena Chianese[3], Miguel Anguel Hernández-Ceballos[4], and Angelo Riccio[3]

[1]Università della Campania "Luigi Vanvitelli", Dipartimento di Matematica e Fisica, viale Lincoln 5, 81100 Caserta, Italy (mauro.rubino@unicampania.it)
[2]Istituto di Scienze dell'atmosfera e del clima, Centro Nazionale delle Ricerche, Via Fosso del Cavaliere 100, 00133 Roma, Italy
[3]Dipartimento di Scienze e Tecnologia, Università Parthenope, Centro Direzionale Isola C4, 80134 Napoli, Italy
[4]Departamento de Física, Universidad de Córdoba, Edificio "Einstein", Planta Baja, Campus de Rabanales, 14071 Córdoba, Spain

Attribution of nitrogen (N) and carbon (C) origin in atmospheric particulate matter (PM) is one of the main focuses of scientific research in the field of air pollution. Here we show how using multiple pieces of information from different techniques, including concentrations of major ions (NO_3^-, NH_4^+, NO^-, SO_4^{2-}, etc...), concentration and isotopic composition of total N ($\delta^{15}N$) and total C ($\delta^{13}C$), characterization of the meteorology, and using state of the art models of atmospheric circulation (Hysplit) and weather prediction (WRF) help understand the causes of PM change in the atmosphere sampled over the historical town of Naples (Italy).

PM samples were collected in May 2016 and November 2016 – January 2017 within the ARIASaNa project. The project was led by the Italian National Research Center (CNR), in collaboration with the Parthenope University and was aimed to monitor air pollution in the main towns of the Campania region. Fine particles with diameter < 2.5 μm (PM2.5) and < 10 μm (PM10) were collected for 24h on pre-cleaned (700 °C for 2 h) quartz filters (Whatman, 47 mm diameter) on top of the historical building complex in Largo San Marcellino (lat. 40.85° N; long. 14.26° E, 53 m.a.s.l.).

The results show some key features:

- All species (major ions and isotopic compositions) measured in autumn-winter samples are much less variable than those measured in spring. This seems to be related to a change in weather pattern which is caused by the land-sea breeze mechanism.
- A significant change of the main species measured is found around the middle of May 2016. This change occurs at the same time as a change in the meteorology of the area, going from high to low pressure.
- The change found in May 2016 is characterized by a strong positive relationship between ammonium (NH_4^+) concentration and the isotopic composition of nitrogen ($\delta^{15}N$), suggesting

that the dominant factor of change in atmospheric N chemistry is the NH_4^+ origin.

We will discuss the results obtained in terms of influence of the meteorology on atmospheric chemistry of N and C, and will try to disentangle the changes due to secondary atmospheric processes from those caused by a change in the primary source of N and C.