7th IBERIAN MEETING
AEROSOL SCIENCE AND TECHNOLOGY
9 TO 11 JULY 2019
RICTA19 LISBON

PRECIPITATION CHEMISTRY IN NW SPAIN: THE FINGERPRINT OF SUMMER WILDFIRES

F. Oduber[1], A. I. Calvo[1], C. Blanco-Alegre[1], A. Castro[1], T. Nunes[2], C. Alves[2], M. Cerqueira[2], F. Lucarelli[3], S. Nava[3], G. Calzolai[3], J. Martín-Villacorta[1], V. Esteves[2], J. Barata[2], R. Fraile[1].

[1] Department of Applied Chemistry and Physics, IMARENAB University of León, 24071 León, Spain.
[2]Centre for Environmental and Marine Studies, University of Aveiro, 3810-193 Aveiro, Portugal.
[3] Department of Physics and Astronomy, Università di Firenze and INFN-Firenze, 50019 Sesto Fiorentino, Italy.

Keywords: aerosols, precipitation, wildfires.
Presenting author email: fodup@unileon.es

The summer of 2016 was a very hot and dry season. These meteorological conditions favored the occurrence of wildfires in the north and west of the Iberian Peninsula. Although the precipitation is scarce during summer, between 14 and 15 August (period P1) and 13 and 15 September (period P2) 2016, two short but intense rain events took place, coinciding with wildfire events. Because wet deposition acts directly on the removal and transport of different pollutants from the atmosphere to the Earth's surface (Seinfeld and Pandis, 2016), it could help mitigate the negative effects of air pollutants emitted by these type of events. Thus, the aim of this study is to determine the impact of forest fire emissions that occurred in the northwest of the peninsula during summer 2016 on the precipitation chemistry in León, Spain.

The sampling campaign was carried out in the Campus of the University of León, at León city, Spain (42º 36′ N, 05º 35′ W and 838 m a.s.l) at 24 hour intervals. The 24-h PM_{10} sampling was performed using a high volume sampler (CAV-Mb, 150 mm diameter quartz filters). PM_{10} samples were analyzed: organic (OC) and elemental (EC) carbon, levoglucosan, water soluble inorganic ions and major trace elements. Rainwater samples were collected with a wet-only precipitation sampler (Eigenbrodt D-21255), and were used for determination of conductivity and pH, dissolve organic carbon (DOC), water soluble ions, water insoluble organic (WIOC) and elemental carbon (WIEC).

On 14 August and 14 September 2016, NAAP images showed a high smoke concentration at the northwest of the Iberian Peninsula, and the air mass trajectories confirmed that the smoke from wildfires reached León city. The air chemical composition showed a significant increase of the main biomass burning tracers, K^+ and levoglucosan, and of EC concentrations during both events, confirming the contribution from wildfire emissions to the airborne aerosol in León on these days.

The mean precipitation intensity was 1.6 mm h^{-1} and 0.85 mm h^{-1} for P1 and P2, respectively, and the accumulate precipitation was 3.72 mm in P1 and 4.63 mm in P2. The P1 rain sample was collected in one fraction of 0.03 L, while P2 was sampled in two fractions of 0.04 L and 0.11 L, respectively.

The chemical composition of P.1 and P.2 shows high concentrations of K^+, NH_4^+, Ca^{2+}, SO_4^{2-} and NO_3^-. These ions are commonly related to smoke particles.

P1 sample had a pH of 4.8 and a concentration of DOC and WIOC of 14.7 and 1.7 mg L^{-1}, respectively, indicating an excess of acidic species, probably organic compounds. Regarding P2, the pH was 5.5, and the neutralization capacity was 0.8, showing that the alkaline constituents prevent the acidification of rainwater in this event. The highest conductivity value was obtained in P1, which has the highest concentration of ions of both studied events

The scavenging effect of the rain is also observed through a decrease in the air pollutant concentrations and a slight increase in the pH of rainwater samples, showing that the rainfall amount and intensity are key factors for cleaning up the atmosphere.

This study was partially supported by the Spanish Ministry of Economy and Competitiveness (Grant TEC2014-57821-R), the University of León (Programa Propio 2015/00054/001 and 2018/00203/001) and the AERORAIN project (Ministry of Economy and Competitiveness, Grant CGL2014-52556-R, co-financed with European FEDER funds). F. Oduber acknowledges the grant BES-2015-074473 from the Spanish Ministry of Economy and Competitiveness. C. Blanco-Alegre acknowledges the grant FPU16-05764 from the Spanish Ministry of Education, Culture and Sport.

Seinfeld, J.H., Pandis, S.N., (2016). *Atmospheric chemistry and physics: from air pollution to climate change*. John Wiley & Sons.