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## Geochemical fingerprints and North-African dust sources: results from a multisite network of aerosol deposition in the southwestern Europe

Jorge Pey<sup>1,2</sup>, Juan Cruz Larrasoaña<sup>3</sup>, Jesús Reyes<sup>3</sup>, Noemí Pérez<sup>4</sup>, José Carlos Cerro<sup>5,6</sup>, Sonia Castillo<sup>7,8</sup>, María Pilar Mata<sup>9</sup>, José María Orellana<sup>3</sup>, Jesús Causapé<sup>3</sup>, Blas L. Valero-Garcés<sup>2</sup>, Belén Oliva-Urcia<sup>10</sup>, Javier Santos-González<sup>11</sup>, and Rosa Blanca González-Gutiérrez<sup>11</sup>

<sup>1</sup>ARAID - Aragonese Foundation for Research & Development, Zaragoza, Spain

<sup>2</sup>IPE-CSIC - Pyrenean Institute of Ecology, Spanish Research Council, Zaragoza, Spain

<sup>3</sup>IGME - Geological Survey of Spain, Zaragoza, Spain

<sup>4</sup>IDAEA-CSIC - Institute of Environmental Assessment and Water Research, Spanish Research Council, Barcelona, Spain

<sup>5</sup>UIB - University of the Balearic Islands, Palma, Spain

<sup>6</sup>Regional Government of the Balearic Islands, Palma, Spain

<sup>7</sup>IISTA-CEAMA - Andalusian Institute for Earth System Research, Granada, Spain

<sup>8</sup>UGR - University of Granada, Department Applied Physics, Granada, Spain

<sup>9</sup>IGME - Geological Survey of Spain, Tres Cantos, Spain

<sup>10</sup>UAM - Autonomous University of Madrid, Madrid, Spain

<sup>11</sup>ULE - Universidad de León, León, Spain

### Abstract

The DONAIRE network (Pey et al. 2020) monitors the phenomenology of geochemical, magnetic and mineralogical variations of bulk atmospheric deposition in the Iberian Peninsula- Balearic Island. In this work we focus on recent North African dust deposition with a double objective: 1) to characterize the main geochemical fingerprints with respect to other sources of pollution; 2) to perform a source apportionment study to identify different desert-dust source areas. We used one year of data (June 2016-July 2017) from 15 monitoring sites (regional and remote, urban, industrial, or agricultural). We focus here on the impact caused by the main 4 North African dust deposition events globally affected this network.

Our results evidence that dust deposition patterns are controlled by: i) the meteorological scenario behind dust transport, ii) the occurrence/absence of wet deposition, and iii) the local-to-regional nearby topography. In general, the largest dust-deposition events occur nearby mountain barriers during low-pressure systems approaching Iberia and NW Africa.

Moderate to intense dust deposition events are well characterized by their chemical composition. The Fe/Ti, Na/Al, K/Al or (Ca+Mg)/Fe ratios reveal a number of patterns across the network. For example, Fe/Ti ratio varies from around 10-13 during warm-season events to 22-35 during cold season episodes, potentially indicating different North-African dust sources.

The best source apportionment solution extracts 10 factor/sources, from which three are mineral in composition. Two of them are interpreted as different North African dust mixture-of-sources, whereas the third mineral factor corresponds to regional dust particles. The overall contribution of such desert-dust sources may explain up to 90% of total episodic deposition during the most intense events.

These results indicate that chemical fingerprinting could be used to infer the recent North African dust deposition history. Studies on lake and peatland sequences following a similar approach are in progress and preliminary data show they be used to trace Saharan dust during the Holocene and reconstruct its relationship with climate phases.

## **Reference**

Pey J., Larrasoaña J.C., Pérez N., Cerro J.C., Castillo S. *et al.* (2020). Phenomenology and geographical gradients of atmospheric deposition in southwestern Europe: results from a multi-site monitoring network. *Sci. Tot. Environ.*, 140745. <https://doi.org/10.1016/j.scitotenv.2020.140745>.

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