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Unraveling the geochemical signals from a major episode of Saharan dust in the Amazon basin.

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The most abundant aerosol emitted annually in Earth's atmosphere is desert dust (22-29 Tg; [1]). In continents, dust impacts may be massive through nutrient supply to ecosystems (e.g., North African dust transport to the Amazon Basin) [2]. However, constraints are still needed to elucidate the bioavailability of dust and associated aerosol according to their type and the chemical transformation affecting them during transport. Identifying predominant North African dust sources is also crucial since dust chemical composition will vary according to the mineralogy, which differs depending on the source region [3].

This study focuses on a high-resolution record of the most massive (PM10 > 300 $\mu g/m^3$) and most extended (10 days) North African dust episode that reached French Guiana since 2021. A recently developed selective extraction protocol has successfully segregated aerosols into different fractions. The water-soluble, acid-soluble, and soot-derived fractions were extracted through a series of leaching processes: first with water, then with 0.5 M HBr, and finally with water after burning. The remaining material is the silicate fraction, which includes dust [4].

The silicate fraction consistently accounts for about 60% of the total composition. However, the water-soluble and acid-soluble fractions indicate that a portion of the aerosol is readily soluble. This includes elements associated with: (1) aging dust (Mg, C), (2) the dissolution of sea salt (Na, Cl), and (3) leaching from soot particles (P, K). Additionally, this information is supported by satellite reanalysis data for PM10, sea salt, and black carbon from the MERRA-2 dataset.

The analysis of the silicate fraction reveals that an unchanged lithogenic source from Western Africa provides most of the elements during the dust outbreak. Back-trajectory, satellite observations, and Sr-Nd-Pb isotope signatures corroborate the stability of dust emission throughout the event. The type of particle will be identified through microscopic observations to determine if a Si-rich source (diatomite, quartz) has also contributed to this event.

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