The radiogenic isotope signature of aeolian dust over Barbados

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The Sahara-Sahel region in Northern Africa is considered to be the largest emitter of aeolian dust in the world and provides a major component of the atmospheric dust blown westwards across the tropical Atlantic Ocean to the Caribbean [1]. That such long-range transport occurs has been verified by finding the radiogenic isotope signature of African dust in aerosols collected at the US Virgin Islands and Tobago [2].

We report a one-year radiogenic isotope (Sr, Nd and Pb) time series of atmospheric dusts at Barbados, collected on a monthly time scale in 2007; this is compared with a similar seasonal record of dust sampled in 2012 at the Cape Verde Atmospheric Observatory. Bulk and PM10 samples were collected on pre-cleaned cellulose filters and processed as described in [2]. The anthropogenic (leachate) Pb isotopic composition is used as a transient tracer in the atmosphere, while Sr, Nd and Pb isotopes in the silicate fraction fingerprint the provenance of lithogenic, detrital sources.

The leachate Pb isotopic compositions from Barbados and Cape Verde form a well-defined linear correlation. This correlation is indicative of mixing between European anthropogenic Pb, in agreement with earlier work [3], and a more radiogenic source. This source appears to originate from North Africa and is possibly represented by soluble carbonate dust as measured in the acetic acid leach fraction. The isotopic signature of the lithogenic fraction at Barbados and Cape Verde constrain dust emission sources to be located in the Northwest Sahara and sub-Sahara/Sahel regions, with negligible contribution from the Bodélé Depression [4].

The relative contributions of African vs. European anthropogenic sources as well as their evolution in the 21st century will be discussed in view of the phase-out of leaded gasoline in Europe and most African countries.

[1] Prospero *et al* (1970) *Earth Planet. Sci. Lett.* **9**, 287-293 [2] Kumar *et al* (2014) *Atmos. Env.* **82**, 130-143 [3] Hamelin *et al* (1989) *J. Geophy. Res.*, **94**, 16243-16250 [4] Abouchami *et al* (2013) *Earth Planet. Sci. Lett.* **380**, 112-123