Geophysical Research Abstracts
Vol. 15, EGU2013-1588, 2013
EGU General Assembly 2013

Radiogenic isotope evidence for transatlantic atmospheric dust transport

Ashwini Kumar (1), Wafa Abouchami (1,2), Virginia H. Garrison (3), Stephen J.G. Galer (1), and Meinrat O. Andreae (1)

(1) Max-Planck Institute For Chemistry, Biogeochemistry, Mainz, Germany (ashwinikumarjha@gmail.com), (2) Westfälische Wilhelms Universität, Institut für Mineralogie, Münster, Germany, (3) U.S. Geological Survey, St. Petersburg, Florida, USA

Early studies by Prospero and colleagues [1] have shown that African dust reaches all across the Atlantic and into the Caribbean. It may contribute to fertilizing the Amazon rainforest [2,3,4], in addition to enhancing the ocean biological productivity via delivery of iron, a key nutrient element[5]. Radiogenic isotope ratios (Sr, Nd, Pb) are robust tracers of dust sources and can thus provide information on provenance and pathways of dust transport. Here we report Sr, Nd and Pb isotope data on atmospheric aerosols, collected in 2008 on quartz filters, from three different locations in Mali (12.6˚N, 8.0˚W; 555 m a.s.l.), Tobago (11.3˚N, 60.5˚W; 329 m a.s.l.) and the U.S. Virgin Islands (17.7˚N, 64.6˚W; 27 m a.s.l.) to investigate the hypothesis of dust transport across the Atlantic.

About 2 cm^2 of filter were acid-leached in 0.5 N HBr for selective removal of the anthropogenic labile Pb component (leachate) and possibly the fine soluble particle fraction. The remainder of the filter was subsequently dissolved using a mixture of HF and HNO_3 acids, and should be representative of the silicate fraction. Isotopic compositions were measured by TIMS on a ThermoFisher Triton at MPIC, with Pb isotope ratios determined using the triple-spike method.

Significant Pb isotope differences between leachates and residues were observed. The variability in Pb isotopic composition among leachates may be attributed to variable and distinct anthropogenic local Pb sources from Africa and South America [6], however, residues are imprinted by filter blank contribution suggesting to avoid the quartz fiber filter for isotopic study of aerosols. The Nd and Sr isotope ratios of aerosol leachates show similar signatures at all three locations investigated. The nearly identical Nd and Sr isotopic compositions in the Mali, Tobago and Virgin islands leachates are comparable to those obtained on samples from the Bodélé depression, Northern Chad [7] and suggest a possible common source origin.

These results identify an African source signal, in aerosols from the Virgin Islands and Tobago collected during African dusts incursion, and thus provides evidence for transatlantic dust transport during the spring/summer season. This, in turn, is entirely consistent with 7-day back-trajectory analysis at these locations as well as recent seasonal AOD maps [8].

[1] Prospero *et al.* (1970) *Earth Planet. Sci. Lett.* **9**, 287-293. [2] Swap *et al.* (1992) *Tellus* **44**, 133-149. [3] Koren *et al.* (2006) *Environ. Res. Lett*. **1**, 014005. [4] Ben-Ami *et al.* (2010) *Atmos. Chem. Phys.* **10**, 7533-7544. [5] Duce & Tindale (1991) *Lim Ocean.,* **36**, 1715-1726. [6] Bollhöfer & Rosman (2000) *Geochim. Cosmochim. Acta* **64**, 3251-3262. [7] Abouchami *et al.* (in prep.) [8] Ridley *et al.* (2012) *J. Geophys. Res.* **117**, D02202.