Isotope Fingerprinting of African Dust from Source to Sink

S. J. G GALER[1*], R. WEI[1], S.P. SINGH[1], D. GUINOISEAU[1], W. ABOUCHAMI[2]

[1]Max Planck Institute for Chemistry, 55128, Mainz, Germany
[2]Universität zu Köln, 50674 Köln, Germany

The impact of mineral dust on climate and biogeochemistry requires knowledge of the sources of dust and emission regions. Time series of radiogenic isotopes (Pb, Sr and Nd) in dusts collected at the Cape Verde Islands and Barbados – a receptor region in the Caribbean – have resolved a seasonal isotopic variability at Cape Verde, as well as a short-term isotopic spike during a winter dust outbreak [1]. The radiogenic isotope fingerprinting of these presently-active North African dust sources, and especially the Saharan Air Layer, are invaluable for linking Quaternary dust records to changes in active emission source areas and wind patterns in the past.

We present grain-sized fractions and leaching experiments on the fine deflatable materials of African soils to evaluate the mechanism and extent of isotope fractionation in emitted Saharan dusts due to grain-size winnowing during transportation. These data are combined with a 180-kyr record of Pb, Nd and Sr isotopes, as well as major and trace elements data, on the detrital fraction of sediment core GeoB2910-1 (4°50'N, 21°03'W, 2,703 m) located on the Sierra Leona Rise (SLR) which provides a record of eolian dust transport westwards from the African continent [2].

The 180-kyr dust record exhibit isotopic variations that are driven by aridity/humidity cycles and prevailing wind regimes over West Africa. The dust contributing sources are identifed as the Bodélé Depression and Northern Mali/Southern Algeria region. The lack of significant glacial-interglacial variations indicates a relatively stable mode of dust emission. Interestingly, Pb isotopes exhibit a systematic shift to more radiogenic compositions during African Humid Periods (AHP). The correlation between Pb isotopes and the North African Humidity Index [3], while none is observed for Sr nor Nd isotopes, illustrates shifts in sources linked to changes in vegetation and hydrography of once dry lake beds, especially Lake Megachad in the Bodélé Depression, and thus in the location of dust emission sources during AHP.

[1] Kumar et al. (2018) *EPSL* **487**, 94-105. [2] Abouchami and Zabel (2003) *EPSL* **213**, 221–234. [3] Tjallingii et al. (2008) *Nat. Geosci*. **1**, 670-675.