

African dust sources contributing to fertilization in the Amazon Basin

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Shift of the ITCZ position southwards during boreal winter enables substantial dust transport from the Saharan region to the Amazon Basin [1]. However, African dust deposition has an un-quantified impact on the Amazon rainforest nutrient mass balance, which potentially sustains and increases its primary productivity [2]. The exact emission source(s) in Africa and magnitude of this nutrient flux remain poorly constrained, but it has been assumed that all of this winter dust comes from the Bodélé Depression (Chad). Here we present radiogenic isotope (Sr, Nd and Pb), as well as major and trace element compositions, from aerosols collected from the 40-m tower above the Amazon rainforest canopy at the ATTO site, near Manaus, Brazil. Two winter/spring time series of atmospheric dusts were sampled between February and April in 2016/17.

The lithogenic residue fraction REE patterns show a clear distinction between dusty and non-dusty days (background). The radiogenic Sr, Nd and Pb isotopic compositions are basically consistent between 2016 and 2017 and independent of dusty or non-dusty days. In terms of African emissions, there is a predominance of Sahelian (Mali/Niger) sources with only a minor input from the Bodélé Depression, with data similar to those obtained from Barbados and Cape Verde aerosols [3]. This conclusion is supported by satellite (MODIS) imagery, as well as back-trajectory analysis.

[1] Engelstaedter et al. (2006) Earth Sci Rev. 79. [2] Swap et al. (1992) Tellus 44B. [3] Kumar et al. (2018) EPSL 487.