Saharan dust inputs to North-Western Atlantic Ocean with three years time series

Y. XU[1], C. DESSERT[1], R. LOSNO[1], F. MONNA[2], V. ROBERT[1], J. CHANE-TENG[1], M. BOYE[1]

[1]Institut de Physique du Globe de Paris (yxu@ipgp.fr)

[2]ArTHéIS, Université de Bourgogne, France

North Africa, the largest dust source worldwide, accounts for 55% of global continental dust emission [1]. These dusts can be transported over long distance, and significantly impact ocean biogeochemistry in the North Atlantic and the ecosystems of the North Tropical Atlantic Islands, after deposition through biogeochemical processes [2,3]. Yet, the inputs of Saharan dust to the North-Western Atlantic are not precisely measured.

In this work, we present time series of dust deposition performed in Guadeloupe, an island situated in the Western North Atlantic Ocean. Atmospheric total deposition was continuously sampled on a weekly basis during three years (2015-2018). Airborne aerosol samples were simultaneously collected during the last 18 months of deposition sampling.

Deposition and aerosol samples were analyzed for major and trace elements including rare earth elements (REEs), together with Nd, Pb and Sr isotopes. Compositional analyses mathematical tool [4] was used to study the elemental composition of trace elements and REEs. It showed (i) seasonal and interannual variations of deposition fluxes of major and trace elements, (ii) samples collected during different years present different trace and REEs compositions and also different Nd isotopic signatures, (iii) Saharan dust and sea-salt depositions can represent significant sources of nutritive trace metals (like Mo and Sr) which are important for ecology systems in North-Western Atlantic and Caribbean Islands, (iv) differences were also observed on Pb isotopic ratios between airborne aerosol and deposition samples collected simultaneously, which are likely due to human activities.

This long time series will help us to better assess the contribution and impact of Saharan dust to the biogeochemical cycle of trace metals in Western North Atlantic.

[1] Muhs et al. (1990) USGS 33, 157-177; [2] Martin et al, Nature 331 (28 January 1988); [3] Clergue et al. (2015) Chem. Geol. 414, 28-41 [4] Aitchison, J. M. 2005.