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Characterisation of nutrients wet deposition under influence of Saharan dust at Puerto-Rico in Caribbean Sea

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Large quantities of African dust are carried across the North Atlantic toward the Caribbean every summer by Trade Winds. Atmospheric deposition of dust aerosols, and in particular wet deposition, is widely acknowledged to be the major delivery pathway for nutrients to ocean ecosystems, as iron, phosphorus and various nitrogen species. The deposition of this dustis so known to have an important impact on biogeochemical processes in the Tropical and Western Atlantic Ocean and Caribbean including Puerto-Rico. However, very few data exists on the chemical composition in nutrients in dusty rain in this region.

In the framework of the Dust-ATTAcK project, rainwater was collected at the natural reserve of Cape San Juan (CSJ) (18.38°N, 65.62°W) in Puerto-Ricobetween 20 June 2012 and 12 July 2012 during thedusty period. A total of 7 rainwater events were sampled during various dust plumes. Complementary chemical analyses on aerosols in suspension was also determined during the campaign. The results on dust composition showed that no mixing with anthropogenic material was observed, confirming dust aerosols were the major particles incorporated in rain samples. The partitioning between soluble and particulate nutrients in rain samples showed that phosphorous solubility ranged from 30 and 80%. The average Fe solubility was around 0.5%, in agreement with Fe solubility observed in rains collected in Niger during African monsoon. That means that the high solubility measurements previously observed in Caribbean was probably due to an anthropogenic influence.

Atmospheric wet deposition fluxes of soluble and total nutrients (N, P, Si, Fe, Co, Cu, Mn, Ni, Zn) to Caribbean Sea were determined. Atmospheric P and N inputs were strongly depleted relative to the stoichiometry of phytoplankton Fe, N, P and Si requirements.The nitrogen speciation was also determined and showed the predominance of ammonium form. 3-D modeling was used to estimate the spatial extend of these fluxes over the Caribbean Sea.