Dust deposition in an oligotrophic marine environment: impact on the carbon budget

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By bringing new nutrients and particles to the surface ocean, atmospheric deposition impacts biogeochemical cycles. The extent to which those changes are modifying the carbon balance in oligotrophic environments such as the Mediterranean Sea that receives important Saharan dust fluxes is unknown. DUNE project provides the first attempt to evaluate the changes induced in the carbon budget of an oligotrophic system after simulated Saharan dust wet and dry deposition events. We will report on the results for the 3 distinct artificial dust seeding experiments in large mesocosms that were conducted in the oligotrophic waters of the Mediterranean Sea in summer 2008 and 2010. Simultaneous measurements of the metabolic rates (C fixation, C respiration) in the water column have shown that the dust deposition did not change drastically the metabolic balance as the tested waters remained net heterotroph (ie. net primary production to bacteria respiration ratio < 1). Considering the different terms of the carbon budget, we estimate that it was balanced with a dissolved organic carbon (DOC) consumption of at least 10% of the initial stock. This corresponds to a fraction of the DOC stock of the surface mixed layer that consequently will not be exported during the winter mixing. Although heterotrophic bacteria were found to be the key players in the response to dust deposition, net primary production increased about twice in case of simulated wet deposition (that includes anthropogenic nitrogen) and a small fraction of particulate organic carbon was still exported. Our estimated carbon budgets are providing knowledge about the key processes (*ie* bacteria respiration, aggregation) that need to be considered for an integration of atmospheric deposition in marine biogeochemical modeling.