Geophysical Research Abstracts
Vol. 18, EGU2016-8003, 2016
EGU General Assembly 2016

Saharan dust enhances carbon sequestration in the North Atlantic

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We present unique time-series data from sediment traps deployed at 3000 m depth in the subtropical North (NOG) and South (SOG) Atlantic oligotrophic gyres during 2007-2010. The sampling sites have similar physical properties and carbon fixation rates but different surface ocean biogeochemistry owing to enhanced input of Saharan dust in the North. NOG and SOG sites are thus ideal to investigate the effects of dust input on carbon sequestration in low-nutrient low-chlorophyll oceans. Analyses of the trap material (chemical, microscopic and stable isotope) revealed significant inter-basin differences in the downward particle flux and its composition, showing that biogeochemical differences at the surface have major effects on deep ocean sequestration scenarios. Particulate organic carbon flux in the dustier Northern gyre was twice that in the dust-poor Southern gyre. We conclude that this is a consequence of tight coupling between fertilization and ballasting due to dust deposition. We suggest that excess of micronutrient Fe from the dust increased phytoplankton biomass by stimulating di-nitrogen fixation, while dust particles caused rapid and more efficient transport to depth via ballasting. These findings present compelling direct evidence of two distinct biogeochemical provinces in the subtropical oligotrophic Atlantic not only with respect to surface nutrient biogeochemistry but also with respect to carbon sequestration.