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Atmospheric Deposition of nutrients and its impact on the marine environment

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Abstract

Atmospheric deposition of trace constituents, both of natural and anthropogenic origin, can act as a nutrient source into the open ocean and affect marine ecosystem functioning and subsequently the exchange of CO₂ between the atmosphere and the global ocean.

Dust is known as a major source of nutrients (Fe and P) into the atmosphere, but only a fraction of these nutrients is released in soluble form that can be assimilated by the ecosystems. Dust is also known to enhance N deposition by interacting with anthropogenic pollutants and neutralisation of part of the acidity of the atmosphere by crustal alkaline species. These nutrients have also primary anthropogenic sources including combustion emissions. The global atmospheric N, Fe and P cycle have been parameterized in the global 3-D chemical transport model TM4-ECPL, accounting for inorganic and organic forms of these nutrients, for all natural and anthropogenic sources of these nutrients including bioaerosols and biomass burning, as well as for the link between the soluble forms of Fe and P atmospheric deposition and atmospheric acidity. The impact of these atmospheric deposition fluxes on the marine environment is investigated in two ways: first by correlations of deposition fluxes proxies with chlorophyll content as seen by satellites and second by using computed atmospheric deposition fluxes of nutrients in ocean models simulations. The results are presented and thoroughly discussed.