# Iron biogeochemistry under a changing climate: Impact on the phytoplankton growth and the diazotrophic nitrogen fixation

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Iron (Fe) plays an essential role in controlling the marine primary productivity and the efficiency of biological carbon pump. Although controversial, Fe is considered as an important trace element which has a strong link to climate change, the sequestration of atmospheric carbon dioxide ($CO_2$) and the global carbon and nitrogen cycles.

The objective of our research is to evaluate how global climate change processes (dust deposition, sea-surface warming and ocean acidification) affect Fe speciation and bioavailability. Will also be assessed the impact of the latter on the role of Fe in controlling biological $N_2$ fixation.

Laboratory culture experiments using a coastal marine diatom (*Chaetoceros socialis)* were examined at two temperatures (13°C and 18°C) and two $CO_2$ conditions (400 $\mu$atm and 800 $\mu$atm). The present study demonstrates clearly the influence of ocean acidification on the release of Fe upon dust deposition. It also shows that dust particles could provide a readily utilizable source of Fe and other macronutrients (dissolved phosphate and silicate) for phytoplankton growth. Elevated $pCO_2$ concentrations may have adverse impact on the diatom growth; warming may cause diatom poleward shifts in biogeographic distribution.

The impact of marine iron biogeochemistry on the natural $N_2$ fixation was tested via field incubation experiments using natureal phytoplankton assemblage in the Bay of Biscay and along the Iberian Margin. According to our preliminary results, $N_2$ fixation rates in oligotrophic waters were tremendously stimulated through the addition of dissolved Fe compared to the control, demonstrating the limitation of $N_2$ fixation by Fe.

More laboratory culture study and field experiments are proposed to obtain a more complete picture of how global change might affect Fe speciation and marine phytoplankton, and how dissolved Fe and mineral dusts could control the distribution and the rates of biological $N_2$ fixation.