Iron sequestration in microalgae and Ocean acidification

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The oceans play a major role in the global carbon cycle. Indeed, they contribute to the absorption of about one quarter of the total CO_2 emitted by anthropic activities [1]. When CO_2 is dissolved in the ocean, it acidifies surface waters, and thus disturbs the oceanic ecosystem including marine phytoplankton. Microalgae absorb metallic elements, especially iron for photosynthesis, through their surfaces. Iron complexation on the micro-organisms cell walls is the first step before its subsequent internalization into the cell. Ocean acidification is expected to change both the metal availability and the microalgae surface properties, which can drastically impact the global iron uptake. The main goal of this project is to anticipate the impacts of ocean acidification on the iron adsorption capacity on the microalgae.

For this purpose, surface charge variations are monitored as a function of pH, by acid-base titrations, onto various model species of microalgae representative of the marine environment: *P. tricornutum* and *T. oceanica*. Iron complexation on cell walls is then studied by titration experiments to construct sorption isotherms. Given the low concentration expected in oceanic system, we use a ^{57}Fe spiking approach during our experiments. Those experiments allow to model sorption of proton and iron onto the cell surfaces. Thus, different parameters can be established: acid-base titrations allow acquiring density and protonation constants for the binding sites, and iron sorption experiments provide affinity constants values for these binding sites.

[1] Sunda, W. G. (2010). Iron and the Carbon Pump. Science, 327(5966), 654-655.