The project aims to expand our knowledge of the biogeochemical cycle of iron in different marine environments. Initially, this involves developing a highly sensitive flow-injection analyser with chemiluminescence detection to measure picomolar concentrations of Fe in seawater. This work will focus on aspects of the inputs of iron to its redox cycle, the iron present in the colloidial fraction and the photo-reduction processes in surface waters.

**CURRENT QUESTIONS ABOUT THE IRON CYCLE & OBJECTIVES**

**RATIONAL**

The study of the iron cycle is of great interest as it has been proved through several fertilisation experiments of the ocean such as SOFIE (see Figure on the left) that iron is a limiting nutrient to primary production in high nutrient, low chlorophyll (NHLC) regions (Martin et al., 1994). As these NHLC areas cover about 40% of the world's oceans, iron limitation could have important implications for global productivity as well as a potential indirect impact on the regulation of CO2 and albedo uptake in the atmosphere.

Iron is an essential element to all living organisms as it is involved in many metabolism reactions such as photosynthesis for plant. To explain this limitation, it has only recently been studied. Several important aspects of its cycle (see Figure below) are still unclear including iron inputs to the oceans and their availability to the biota and its chemistry. Several of these aspects of the iron cycle will be investigated in this project.

**REFERENCES**


**ANALYSER FOR IRON AT PICOMOLAR CONCENTRATIONS**

- This flow-injection analyser with chemiluminescence detector (FLC) is designed to measure Fe(II) at extremely low concentrations (picomolar) in seawater and is based on the work of Bruland et al. (1994).
- The detection system consists of a photo-multiplier tube which detects the photons emitted during the oxidation of luminol (a reaction that releases Fe(II) into the sample when Fe(III) interacts with it).
- The detection limit is ~ 40 pM, and allows close to real-time measurements.

**Ongoing work**

- Find stage for the optimisation of the iron analyser
- Assessment of the precision and accuracy of IAEA standards of the analyser
- Analysis of a set of samples including estuarine, open-ocean and shelf regions
- These samples have been filtered and acidified for preservation analysis
- A set of samples have been collected off the coast of South America for Fe concentration with depth, which is consistent with the general nutrient-like distribution of TD Fe in the water column in South American coastal waters
- The results from the South American coastal region are still unclear including iron inputs to the oceans and their availability to the biota and its chemistry. Several of these aspects of the iron cycle will be investigated in this project.