IRON RESOURCES AND OCEANIC NUTRIENTS - ADVANCEMENT OF GLOBAL ENVIRONMENT SIMULATIONS (IRONAGES). CONTRACT : EVK2-CT1999-00031. PROJECT DURATION: 2000 — 2003.

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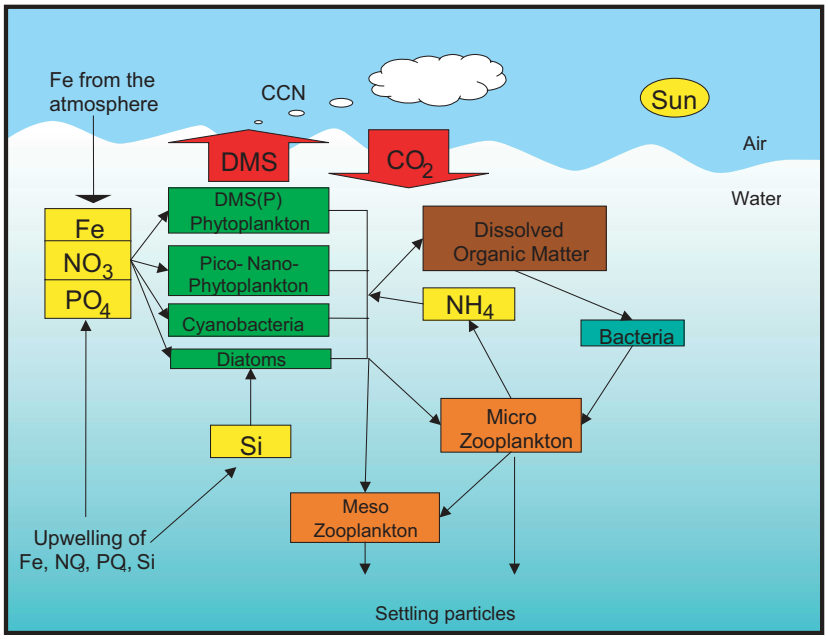
The overall objective of the IRONAGES project was to develop new realistic Ocean Biogeochemical Climate Models (OBCM's) for budgeting the exchanges of the greenhouse gases CO_2 and DMS (dimethylsulphide) between the atmosphere and the ocean. This was done by studying:

1) Effects of co-limitation by four nutrients (nitrogen, phosphate, silicate and iron) on 5 major taxonomic classes of phytoplankton,
2) DMS(P) pathways in the oceans,
3) global oceanic iron cycling,
4) different chemical forms of iron and
5) supply of iron from marine sediments and from atmospheric sources into the ocean.

Major scientific achievements were the quantification of iron input originating from anoxic sediments of coastal margins and quantification of aeolian iron input from Sahara-derived dust blown over the central Atlantic Ocean. The field campaigns for these quantifications were done on our research vessel Pelagia. In an experimental set-up, we could show that diatoms receiving extra desert dust grew considerably faster than the controls . We also discovered that the diatoms could utilise only a limited part of the dissolved iron from the dust. This was established by culturing the diatoms in seawater without dust, but with different concentrations of dissolved iron. The growth of the algae that received known quantities of iron was subsequently compared with that of the diatoms which grew on dust, thereby indicating the fraction of bio-available iron from the dust. These experiments were the first ever to show the causal effect of atmospheric dust on phytoplankton growth, with concomitant effects on exchange of CO_2 and DMS between the atmosphere and the surface ocean.

Literature studies were performed to observe lacks in knowledge on five groups of marine primary producers, including two major DMS producing colony-forming algae *Phaeocystis* sp. and calcifying *Emiliania huxleyi* , as well as three other major classes of marine phytoplankton: diatoms, N_2-fixing diazotrophs and small pico- and nanophytoplankton. Where lacks in knowledge were observed, additional experiments were done. These experiments focussed on the effects of N, P, Si, Fe and light limitation on the physiology of five phytoplankton groups. The ensuing know-how was used for improvement of an existing phytoplankton ecosystem model (SWAMCO). This, in combination of improvement and expansion of a global iron model was used for improvement of the existing ocean biogeochemical climate models, resulting in a better understanding of global CO_2 and DMS fluxes between the atmosphere and the ocean.

The main products of the IRONAGES project were publications in international, peer reviewed journals, oral and poster presentations at (inter)national conferences and/or seminars and a website (http://wwwold.nioz.nl/projects/ironages/index.htm) where detailed information on the results can be found.



Simplified cartoon of a marine ecosystem incorporating multiple phytoplankton species, CO_2, DMS, and Fe from sedimentary and atmospheric sources.