IEAGHG Information Paper; 2012-IP12: Ocean Fertilisation

Background: **Article in Chemistry World (www.rsc.org/chemistryworld/2012/07/ocean-fertilisation-shows-promise-carbon-sequestration)**

Ocean Fertilisation seems to have hit the headlines recently and an article in Chemistry World on new research on the topic has been widely picked up and circulated by the various CCS bulletin producers. See full article at link above.

The article refers to new results from an experiment that took place in 2004. The new data from iron fertilisation experiments in the Southern Ocean support the idea that artificially created algal blooms can draw carbon to the bottom of the ocean, where it may be stored for centuries.

However I think we need to put this new research into context. There have been several groups that have published detailed reviews on ocean fertilisation. Once such group is the National Oceanic and Atmospheric Administration (NOAA) in the USA, which reported to the US congress in 2010. This report reviews two decades of ocean fertilisation research that has focused primarily on adding the micronutrient iron to regions of the ocean that are iron-poor.

All reported ocean fertilisation experiments have resulted in increased growth of phytoplankton. However, it concluded that the resulting transfer of organic material from the surface ocean into the deep ocean and the compensating transfer of carbon into the ocean from the atmosphere criterion have not been verified. The new research my go some way to verifying the sequestration of carbon in the deep ocean.

The report also makes the following further points:

- Modelling studies also suggest that the maximum possible impact of ocean fertilisation on atmospheric CO_2 concentrations is likely to be a small fraction of what is needed to stabilise atmospheric levels,
- There are also environmental risks associated with ocean fertilisation. Adding nutrients to the ocean causes changes in the structure and functioning of marine ecosystems, and these changes may result in unintended negative consequences. Scientists hypothesise that such consequences may include:
    - decreases in productivity in ocean regions remote from the fertilisation site;
    - alteration of the relative abundance, size structures and diversity of higher trophic levels, including (but not limited to) economically important species;
    - increases in deep ocean hypoxia or anoxia;
    - increases in the oceanic production of the greenhouse gases nitrous oxide and methane;
    - generation of toxin-producing algae;
    - introduction of toxic chemicals at the fertilisation site (depending on the composition of the fertilisation material);
    - increases in ocean acidification with associated increased impacts in sub-surface ecosystems already vulnerable to ocean acidification.

Concern about the environmental consequences of proposed large-scale ocean fertilisation experiments triggered the development of an international regulatory mechanism through the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, to which the United States is a Party.

Despite the new research some of the fundamental issues with regard to ocean fertilisation remain, namely its ability to make a significant impact on the stabilisation of atmospheric CO_2 emissions and most importantly the perceived environmental risks mean that it does not look like a good option for greenhouse gas mitigation.

The NOAA report can be found at:
www.gc.noaa.gov/documents/2010_climate_fert_rept_Congress_final.pdf

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