

# THE IMPACT OF OCEAN NOURISHMENT ON THE OCEAN CARBON CYCLE

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## **ABSTRACT**

The upwelling of nutrients from the deep ocean sets the flow rate of carbon moved by the biological pump by bringing nutrients to the photic zone. Here solar energy converts inorganic carbon to organic material that cannot communicate with the atmosphere. As a consequence of gravitational sinking, the majority of the carbon in the biological cycle is in the deep ocean isolated from the atmosphere and can be considered part of a closed cycle. Increasing the carbon flow of the biological pump, that is increasing the pumps capacity from its present value of 4.5GtC/yr, will have the effect of drawing carbon from atmosphere and the land to augment the cycle.

When considering the ocean as a whole over the many year time scale, the capacity of the pump is limited by the total amount of nutrients involved in the cycle. Let us only consider nitrogen as the major limiting nutrient, followed by phosphate. Carbon can be considered a passive follower of the oceanic nitrogen cycle.

Recognizing carbon and nitrogen involved in the biological pump in the mole ratio of about 6.7:1, the amount of new reactive nitrogen needed to control the atmospheric carbon dioxide level can be estimated. Can this amount be produced by the global economy? Is this more economical than alternatives strategies to manage atmospheric carbon dioxide?

Will humans be delighted with a more productive ocean that will persist for ever? Doubling new primary production will sequester 4.5 GtC/yr (16 GTC/yr) decreasing over a few hundred of years as the previously added nitrogen is recycled by upwelling. How does this value compare with the known fossil carbon reserves? Can the extra marine biomass be harvested by the wild fishery industry, maintaining an acceptable balance of the new marine ecosystem? A larger transformation in productivity has been made on the land in search of protein for human consumption. Will the extra protein produced more than pay for the production of nutrients needed for Ocean Nourishment?