Effects of Varying Atmospheric Nutrient Inputs to Global Ocean Biogeochemistry Over the Industrial Era

Aparna Krishnamurthy[1], Ashok Karumuri[1], R. Krishnan[1], J.K.Moore[2]

[1]*Indian Institute of Tropical Meteorology, Pune*
[2]*University of California, Irvine*

Results of sensitivity studies with a coupled global ocean model to understand the possible role of increasing anthropogenic inorganic nitrogen and soluble iron from atmospheric processing of dust and combustion into the oceans are presented. Increased fossil-fuel combustion and agriculture since pre-industrial times have elevated N deposition in to oceans. Soluble Fe inputs have also increased under increased atmospheric processing in presence of anthropogenic pollutants as well as from combustion sources. Our simulations indicate that, compared to the pre-industrial era, increasing soluble iron inputs via combustion sources and atmospheric processing of mineral aerosols along with atmospheric anthropogenic nitrogen inputs resulted in a maximum global increase in primary production by ~2.4% in the later period. This increased the sinking POC export at 103m by ~3.2% leading to a reduction in atmospheric pCO_2 by ~2.2ppm. This contribution to atmospheric CO_2 reduction is small as compared with the total observed increase of ~100ppm, but would likely continue to increase in the coming decades as nutrient inputs to the oceans continue to rise.

In the context of Indian Ocean, we propose to make a few sensitivity experiments using latest data of observed nutrients to evaluate the possible impacts of the nutrient variations over the industrial era on Indian Ocean ecosystem, biogeochemistry and the carbon cycle.

References

[1] Krishnamurthy, A., J. K. Moore, N. Mahowald, C. Luo, S. C. Doney, K. Lindsay, and C. S. Zender (2009), Impacts of increasing anthropogenic soluble iron and nitrogen deposition on ocean biogeochemistry, *Global Biogeochem. Cycles*, 23, GB3016, doi:10.1029/2008GB003440.