Geophysical Research Abstracts, Vol. 9, 00711, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00711

Natural rates and nutrient limitation of nitrogen fixation in Atlantic and Mediterranean waters with respect to atmospheric nutrient supply

A. Rees (1), C. Law (1,2) and N. Millward (1,3)

(1) Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth, PL1 3DH, UK, (2) Now at the National Institute of Water and Atmospheric Research, 301 Evans Bay Parade, Greta Point, PO Box 14-901, Kilbirnie, Wellington, New Zealand, (3) University of Newcastle-upon-Tyne, Dept. of Marine Science & Technology, Newcastle-upon-Tyne, NE1 7RU (apre@pml.ac.uk / Fax: +44 1752 633101 / Phone: +44 1752 633419)

It is now recognised that in parts of the oceans, nitrogen fixation by prokaryotic organisms may represent a significant fraction of new nitrogen supply to surface waters, but that nutrients other than nitrogen may exert the pressure which controls microbial productivity. The supply of iron and phosphate is a pre-requisite of nitrogenase activity in diazotrophic organisms, though for the oligotrophic oceans, both iron and phosphate are often present in limiting quantities. Under these conditions the fixation of di-nitrogen may be the dominant source of new nitrogen which may or may not be influenced by the availability of one or both of these nutrients. During recent AMT cruises we have investigated the variance in rates of nitrogen fixation along a meridional transect, whilst during 2002 in the eastern Mediterranean (CYCLOPS) and in 2004 in the north-eastern sub-tropical Atlantic (FeeP), large scale ($\sim$25 km^2) enrichment experiments were performed to investigate the impact of the addition of PO_4^{3-} (Cyclops & FeeP), and PO_4^{3-} plus Fe^{2+} (FeeP) on the microbial activity in surface waters. During each of these studies ^{15}N natural abundance of the particulate nitrogen and rate measurements of nitrogen fixation (using $^{15}N_2$) were made over periods of up to 10 days following addition. Iron didn't appear to limit nitrogen fixation during either of the addition experiments although PO_4^{3-} addition appeared to stimulate diazotrophy in both, unprecedented high rates of nitrogen fixation were found in the Mediterranean Cyprus Eddy, which appeared to be supported by dissolved organic phosphorous.