Geophysical Research Abstracts, Vol. 9, 04058, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04058

Decoupling of new and export production in a naturally iron fertilised HNLC region: Is this due to a short-term storage of dissolved organic nitrogen in surface waters?

P.J. Morris (1), R. Sanders (1), R. Turnewitsch (2), S. Thomalla (3), S. Torres-Valdes (1)

(1) National Oceanography Centre, Southampton, UK (2) The Scottish Association for Marine Science, UK (3) University of Cape Town, South Africa, (pjmorris@noc.soton.ac.uk / Phone: +44 (0)23 8059 2012 / Fax: +44 (0)23 8059 3052)

It has long been recognised that there are oceanic regions that have persistently low chlorophyll levels, even though there are abundant inorganic nutrients. Such regions are referred to as high nutrient low chlorophyll (HNLC) areas. Studies have shown that the depleted iron concentrations in these areas are low enough to limit phytoplankton growth, and mesoscale iron fertilisation experiments have shown that by making the surface waters iron replete, biological production can be enhanced. The question that still remains enigmatic is whether these iron induced blooms act as efficient mechanisms to sequester carbon to mesopelagic depths. Subantarctic islands in the HNLC Southern Ocean are also a source of iron and thus fuel the annual phytoplankton blooms that are observed in their proximity, potentially resulting in elevated levels of carbon export. To test this hypothesis, estimates of particulate organic carbon (POC) export were made using the ^{234}Th technique around the Crozet Islands (52ºE, 46ºS) during the austral summer of 2004/5 as part of the CROZEX project. Remote sensing shows that high chlorophyll levels (peak = 4 μg l^{-1}) occurred north and downstream of the islands relative to those found south and upstream of the islands (background chlorophyll = 0.3 μg l^{-1}). POC export was estimated to be approximately 15 mmol C m^{-2} d^{-1} in the high chlorophyll bloom region, compared with 5 mmol C m^{-2} d^{-1} in the low chlorophyll, non-bloom region. After a moderately small bloom in the low chlorophyll region (peak = 0.7 μg l^{-1}) equal levels of POC export (*ca.* 22 mmol C m^{-2} d^{-1}) were found in the two regions. After comparing the ^{234}Th derived POC export estimates with estimates of new production, calculated

from nitrate drawdown budgets, it became apparent that a decoupling of new and export production was occurring, with this effect most apparent within the bloom area. It is hypothesised that this decoupling of new and export production was due to a short-term buildup of the dissolved organic nitrogen pool in the euphotic zone of the bloom region, thus reducing the amount of particulate organic material that was available for export to mesopelagic depths.