

Association for the Sciences of Limnology and Oceanography





Home

Members

Libraries

Publications

Meetings

Employment

Activities

Search

Phosphorus cycling in the North Pacific Subtropical Gyre using cosmogenic 32P and 33P

Benitez-Nelson, Claudia R., David M. Karl

Limnol. Oceanogr., 47(3), 2002, 762-770 | DOI: 10.4319/lo.2002.47.3.0762

ABSTRACT: The North Pacific Subtropical Gyre (NPSG) has been hypothesized to be in transition from a nitrogen (N)-limited system to one predominantly limited by phosphorus (P) as a result of a two-decade-long selection for N₄-fixing organisms. In this study, the naturally occurring cosmogenic radioisotopes, ³²P (half-life = 14.3 d) and ³³P (halflife = 25.3 d), were measured and ³³P/³²P activity ratios were used to estimate radioactive P residence times at Sta. ALOHA (22^{*} 45'N, 158° 00'W) in the NPSG from February 1999 to July 2000. The 3P/3P activity ratio in the total dissolved P pool varied considerably but systematically; high ratios correlated with periods of enhanced primary production ("C incorporation). Marine particulate 33P/32P activity ratios were similar to those found in the source (i.e., rain). Smaller size classes had longer apparent residence times. The observation that the activity ratio of 33P/32P closely follows primary production suggests that atmospherically derived 32P and 33P atoms track the most [[]bioavailable[[] pool of P within the NPSG ecosystem. These preferred substrates were removed from the dissolved phase via plankton uptake during periods of high productivity. Our results suggest that the soluble nonreactive P pool, which is substantially larger than the soluble reactive P pool, is a potentially important source of P to organisms and that its utilization can vary significantly on scales of weeks to months.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.