



Bioavailability of dissolved organic phosphorus in the euphotic zone at Station ALOHA, North Pacific Subtropical Gyre

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ABSTRACT: The biologically available phosphorus (BAP) and soluble reactive phosphorus (SRP) concentrations and phosphorus (P) uptake rates within the euphotic zone (0-175 m) were measured on eight cruises between October 2000 and November 2001 to Sta. ALOHA (22.75° N, 158° W) in the North Pacific Subtropical Gyre. The SRP concentrations in the upper 100 m ranged from 7 to 84 nmol P L⁻¹, with a mean concentration of 41 nmol P L⁻¹ (SE = 4, n = 40). The BAP pool consistently exceeded the SRP pool by factors of 1.4-2.8 in the upper 100 m, the additional P amounting to 7-15% of the dissolved organic P (DOP) pool, assuming that the measured SRP pool is fully bioavailable. Mean P uptake rates, based on SRP concentrations, ranged from 0.8 to 4.0 nmol P L⁻¹ d⁻¹, with the highest rates in the surface waters decreasing with increasing depth. Mean P uptake rates that are based on BAP concentrations ranged from 0.6 to 8.0 nmol P L⁻¹ d⁻¹, with a maximum at ~45 m, the depth corresponding to the highest adenosine-5'-triphosphate concentrations and highest DOP: SRP ratios. In the 125-175-m depth interval, SRP concentrations increased from 74 to 200 nmol P L⁻¹ and DOP declined by an average of 70 nmol P L⁻¹. Because of the lower DOP concentrations at these depths, the contribution to BAP from the DOP pool increased to ~25%. These results indicate that the microbial community utilizes combined P compounds for their P nutrition simultaneously and, on average, uses them to the same extent as SRP in the upper water column. These results have important implications for P biogeochemistry in low-inorganic nutrient environments.

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