

B vitamin cycling in the North Pacific Subtropical Gyre during natural and bloom-induced conditions

Submitted by: D.A. del Valle, S. Sañudo-Wilhelmy, D.M. Karl

In some oceanic regions, vitamin bioavailability might limit primary production and control phytoplanktonic community composition. Despite the potential importance of these compounds in the surface waters of the ocean, knowledge about their abundance and cycling is scarce. As part of the HOE-DYLAN expedition and in subsequent laboratory experiments.

In the past year, samples for dissolved B-vitamin concentrations were analyzed at the University of Southern California by S. Sañudo-Wilhelmy, using liquid chromatography/tandem MS. It was found that, at Station ALOHA, summer-time concentrations of measured B-vitamins (B_1 , thiamine; B_2 , riboflavin; B_6 , pyridoxine, B_7 , biotin; B_9 , folic acid; B_{12} , cobalamin) do not exceed 30pM and follow a similar depth pattern, with higher concentrations in the top 100m, decreasing to <1pM at depths >200m (Figure 1). B-vitamin concentrations were not observed to show any clear diel cycle.

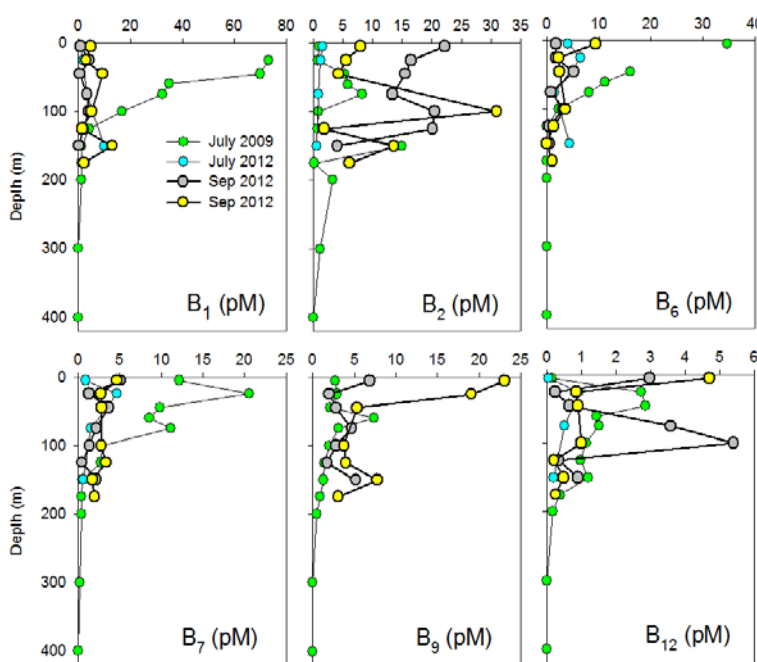


Figure 1: Dissolved B-vitamin concentrations at Station ALOHA

In the mixed layer, B_1 uptake was carried out mostly by the $0.6\mu\text{m}$ size-fraction (76%), indicating that B_1 uptake is mainly controlled by small prokaryotes. Phytoplankton blooms were induced in 20L microcosms by addition of filtered 300m seawater to 25m seawater followed by light-incubation. The growth of large phytoplankton (>10 μm) was highly correlated with the uptake of B_1 , in agreement with the lack of B_1 biosynthetic pathways in many diatoms. The >10 μm fraction was responsible for 40% of B_1 uptake at the peak of the bloom.

Results indicate that B-vitamins are available, albeit at very low concentrations, in surface waters of Station ALOHA under non-bloom conditions; with prokaryotes normally dominating B_1 uptake, and large phytoplankton competing for B_1 under bloom conditions.

These data were presented at the Ocean Science Meeting that took place in Honolulu in February 2014.