



Assessing nutrient limitation of *Prochlorococcus* in the North Pacific subtropical gyre by using an RNA capture method

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ABSTRACT: It has been hypothesized that the planktonic community of the North Pacific subtropical gyre (NPSG) underwent a "domain shift" in the early 1980s in which phytoplankton of the domain Eukarya were supplanted by phytoplankton of the domain Bacteria, primarily *Prochlorococcus*. P limitation of eukaryotic phytoplankton was implicated as the causative chemical factor in the domain shift, and we sought to investigate the current nutrient limitation status of *Prochlorococcus*, now 2 decades since this event. We measured ribonucleic acid (RNA) synthesis rates by NPSG plankton at Station ALOHA in $^{32}\text{PO}_4^{3-}$ tracer incubations and found that RNA synthesis was the single largest biochemical sink for dissolved P, accounting for about half of the total PO_4^{3-} uptake. We also found that NH_4^+ stimulated RNA synthesis but that PO_4^{3-} did not, which suggested N limitation of plankton growth. We developed a new RNA capture procedure, termed radioisotope-based tracking of RNA synthesis by hybridization and capture (RIBOTRACE), to measure RNA synthesis rates by *Prochlorococcus* exclusively. Data from this procedure showed that NH_4^+ stimulated RNA synthesis by *Prochlorococcus* and confirmed that *Prochlorococcus* was N limited and not P limited. Our RIBOTRACE data do not necessarily refute the domain shift hypothesis, but suggest that any critical period of P limitation required for the domain shift must have subsided and given way to the N-limiting conditions that existed previously.

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