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Direct Temperature Effects on Microbial Community Facilitated Phosphate Turnover

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Fluxes and transformation of phosphorus in the marine system is mediated through microbial communities, which are highly sensitive to their physio-chemical environments and change rapidly in response to changing conditions. Characterizing responses by the microbial community to temperature is key to predicting future changes in the marine phosphorus cycle with global warming. Seawater samples from Biscayne Bay, off the coast of Miami, Florida, were incubated at ambient and elevated seawater temperatures for five days to assess the direct impacts of temperature on microbial activity and phosphorus cycling. Additionally, light and dark seawater incubations were conducted to differentiate the average activity of phytoplankton within the microbial community. In the seawater samples, we quantified concentrations of dissolved inorganic phosphorus, dissolved organic phosphorus, particulate phosphorus, and measured microbial community phosphate uptake rates. We assessed microbial metabolic activity by quantifying phosphorylation rates of adenosine triphosphate (ATP) and adenosine monophosphate (AMP), which are directly related to metabolic rates and growth rates, respectively. The quantification of multiple phosphorus pools and rate measurements will highlight the interplay between changes in metabolic energy processes and the phosphate cycling under variable temperature environments. We hypothesize that phosphorus uptake rates and turnover will increase under elevated temperatures, drawing down inorganic phosphate and producing organic phosphorus.