

Controlling Factors of PO_4 and Dissolved O_2 in Tampa Bay

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Abstract

In the open ocean where phosphate is limiting, photosynthesis shapes the inverse relationship between phosphate and dissolved oxygen. Phosphate and oxygen concentrations were measured to determine if a similar relationship can be found in Tampa Bay, FL. We determined that phosphate is not a limiting nutrient in this area due to high concentrations from the Alafia River. Both phosphate and oxygen are controlled by separate physical processes more so than photosynthesis. No correlation was found; therefore the relationship between phosphate and oxygen does not reflect that of the open ocean.

Introduction

- Weathering releases PO_4 from sediment into rivers which flow into the ocean
- PO_4 is consumed during photosynthesis which releases O_2 in surface waters
- Wave action injects O_2 from the atmosphere into the sea surface
- O_2 is consumed during respiration
- Hypothesis: We believe that there will be an inverse relationship between phosphate concentration and oxygen saturation in Tampa Bay due to biological processes.



Figure 1. Map of Tampa Bay with sites marked. Alafia River denoted as AL.

Results

- Alafia River PO_4 concentrations measured 20-30 μM , about ten times greater than that of Tampa Bay
- Strong inverse relationship between salinity and PO_4 ($R^2 = 0.7469$; data not shown)
- PO_4 concentrations highest near Alafia River and decrease with distance

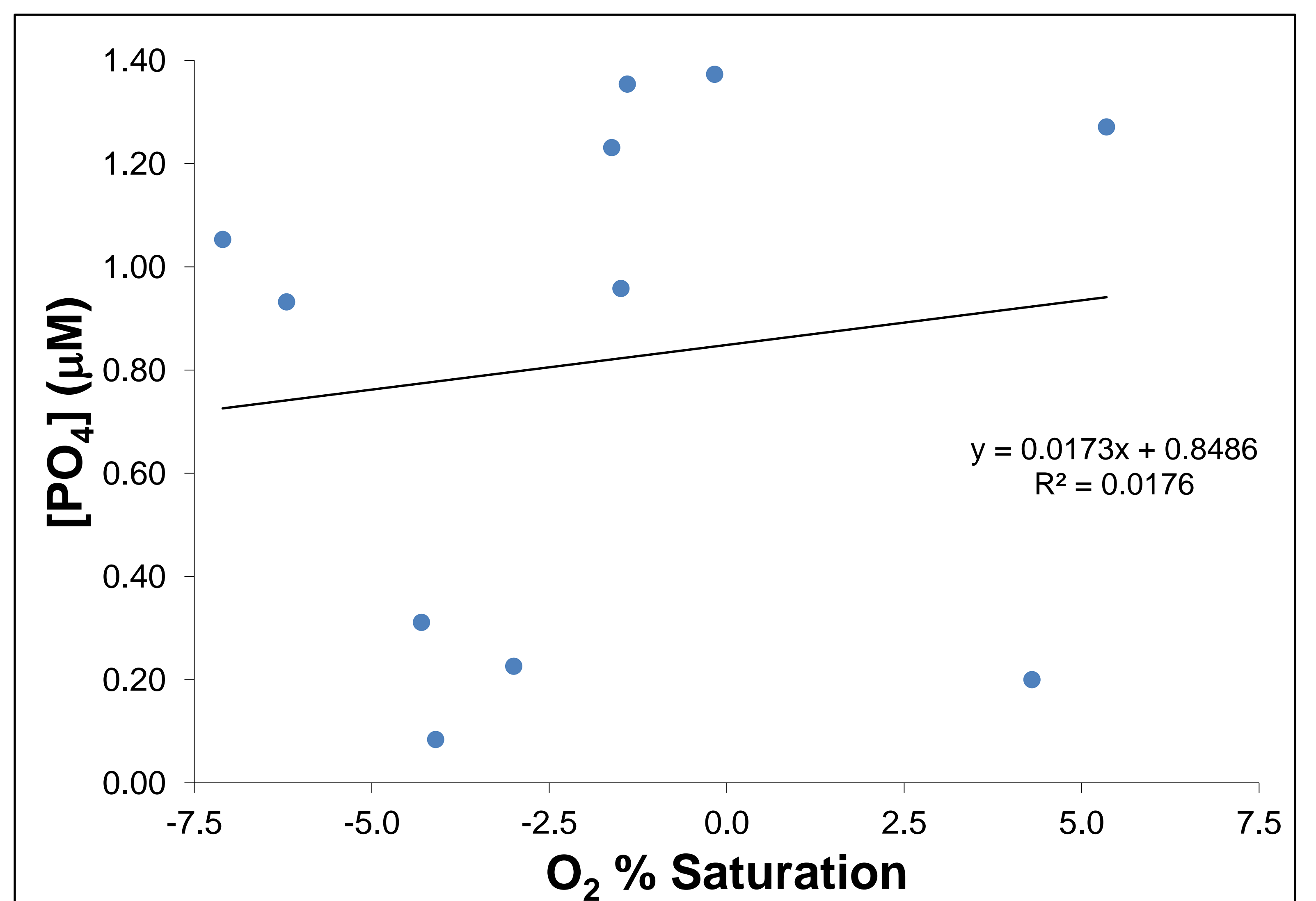


Figure 2. Surface phosphate concentrations (μM) versus percent oxygen saturations at sites 2 through 12 in Tampa Bay. Site 1 omitted due to its location at the mouth of the Alafia River.

Discussion

- Figure 2 shows O_2 saturation and PO_4 are not inversely related in Tampa Bay, therefore we reject our hypothesis
- Dissolved O_2 is undersaturated in Tampa Bay, indicating that respiration occurs more than photosynthesis
- PO_4 is not a limiting nutrient in Tampa Bay
- PO_4 and O_2 saturation are controlled by separate physical processes
 - Low density freshwater with high PO_4 from the Alafia remains at the surface, with little mixing
 - O_2 is influenced by time of day and wave action caused by winds

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Methods

- Water samples collected from 12 sites at various depths with Niskin bottles from Tampa Bay on April 2 and 3, 2012
- Alafia River samples collected April 11, 2010
- Absorbance of samples with and without mixed reagent measured at 885 nm
- Standard curve created to calculate phosphate concentrations