

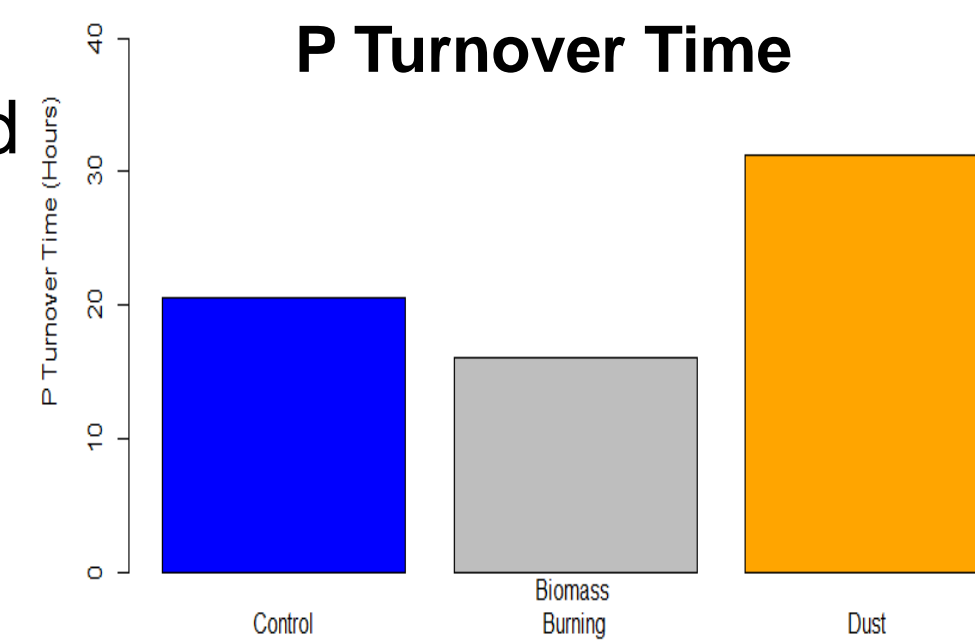
# Enhanced Phosphorus Uptake Rates in Marine Microbes Exposed to Dust and Biomass Burning Aerosols

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## Background:

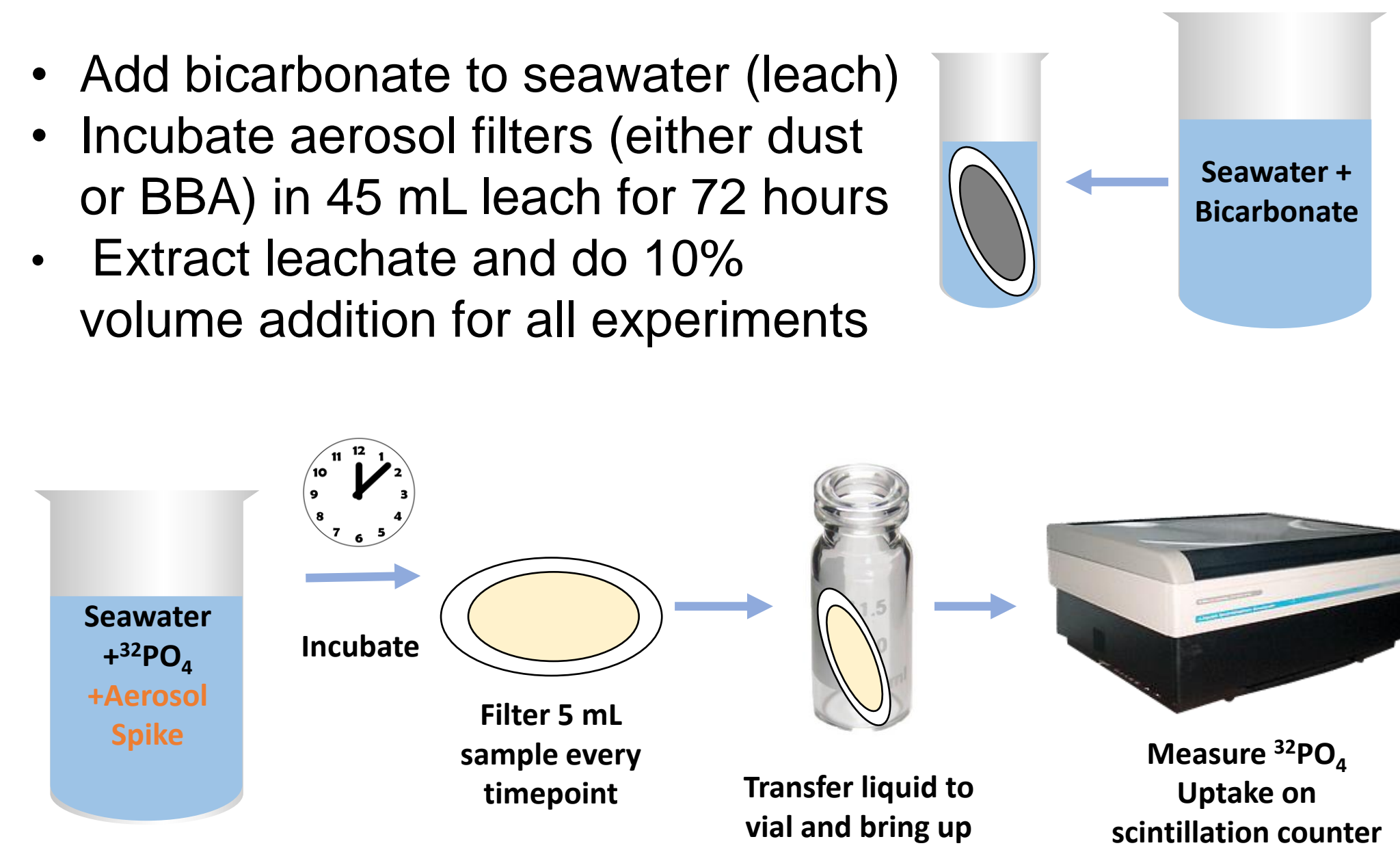
- Phosphorus (P) is an essential macronutrient for all life, and surface ocean are often limited or co-limited by P<sup>1</sup>
- Dust and biomass burning aerosols (BBA) are hypothesized to stimulate microbial growth by depositing nutrients to the ocean— ultimately, helping modulate carbon dioxide concentrations
- Previous research has shown that P delivered by dust and BBA has different solubility in seawater. If the nutrients are insoluble, they offer little benefit to the marine microbes<sup>2</sup>
- To determine whether the deposited P is biologically available P (BAP), novel methods were used to assess the P uptake and production rates of microbial incubations separately spiked with dust and BBA



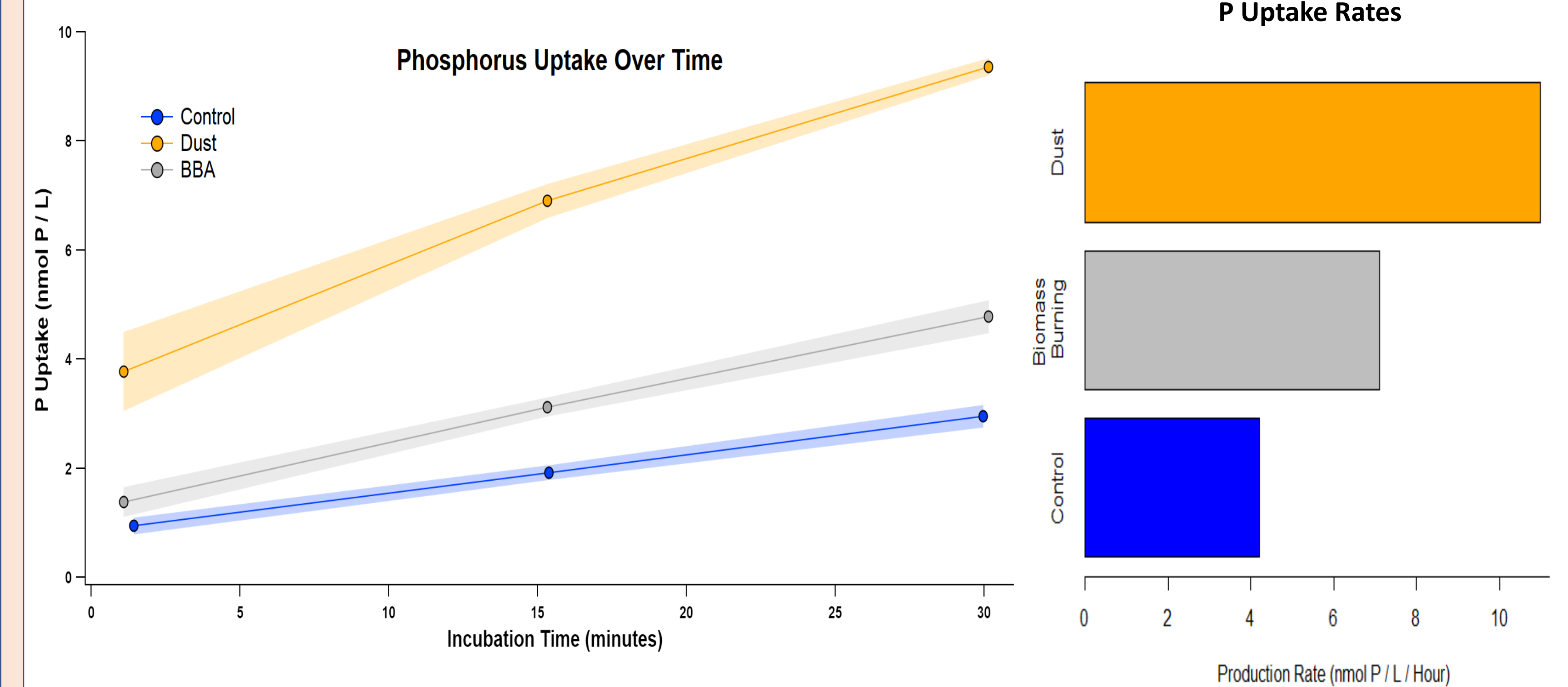
## P Uptake Methods:

### Preparing the Conditional Spikes:

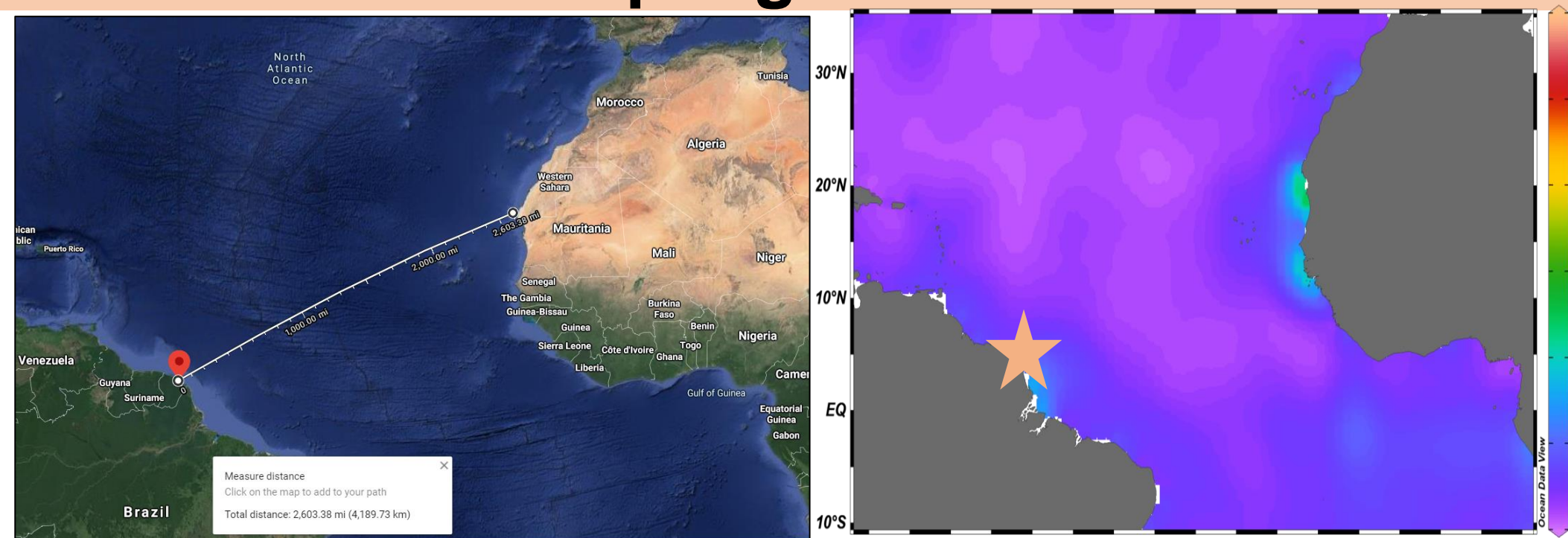
- Add bicarbonate to seawater (leach)
- Incubate aerosol filters (either dust or BBA) in 45 mL leach for 72 hours
- Extract leachate and do 10% volume addition for all experiments



## P Uptake and Production Rates:



## Sampling Location:

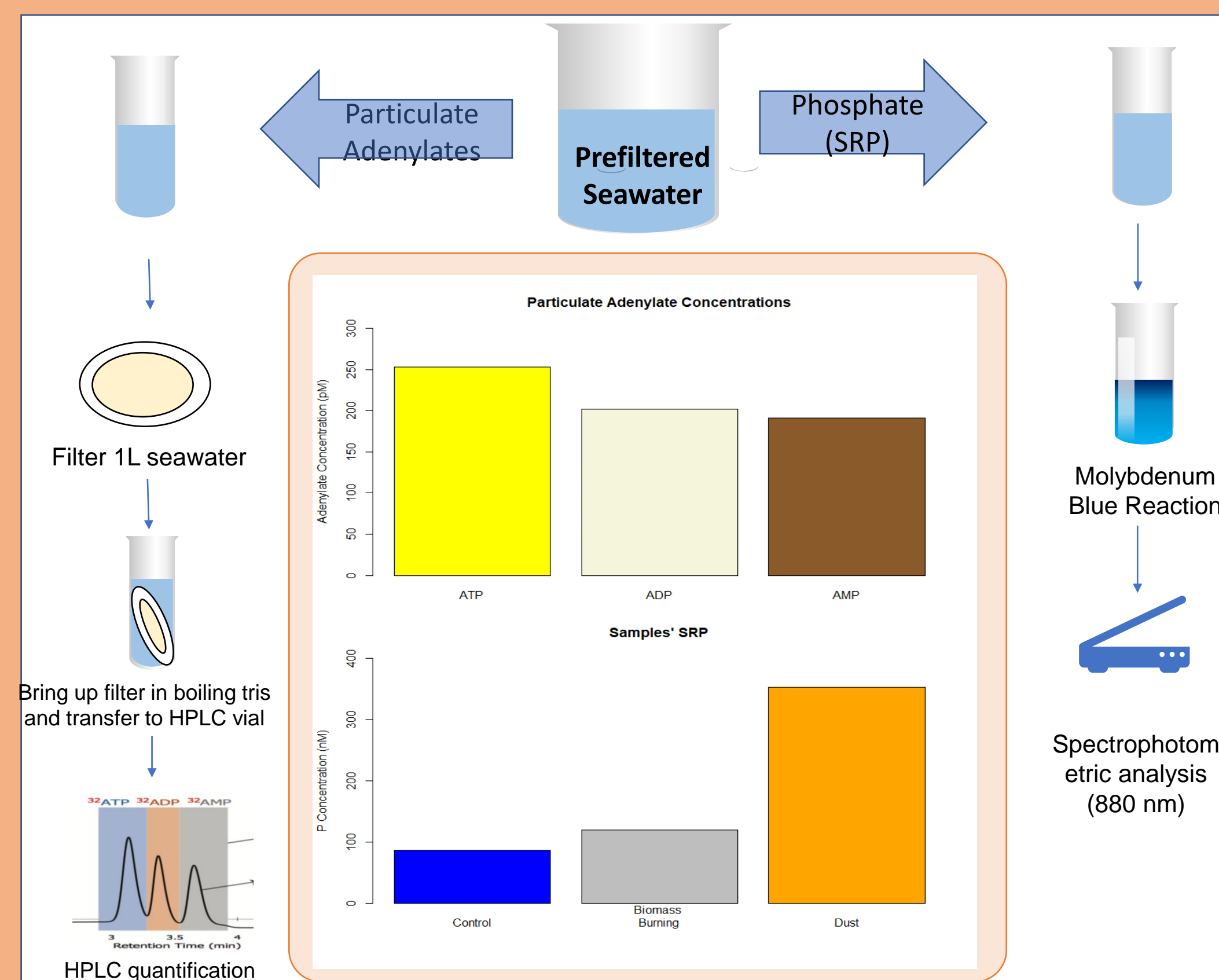


Field samples were collected from Cayenne, French Guiana (sampling location highlighted with the orange star). The figure on the right shows the surface SRP concentration in micromole / kg, and highlights that the TAO is SRP depleted.

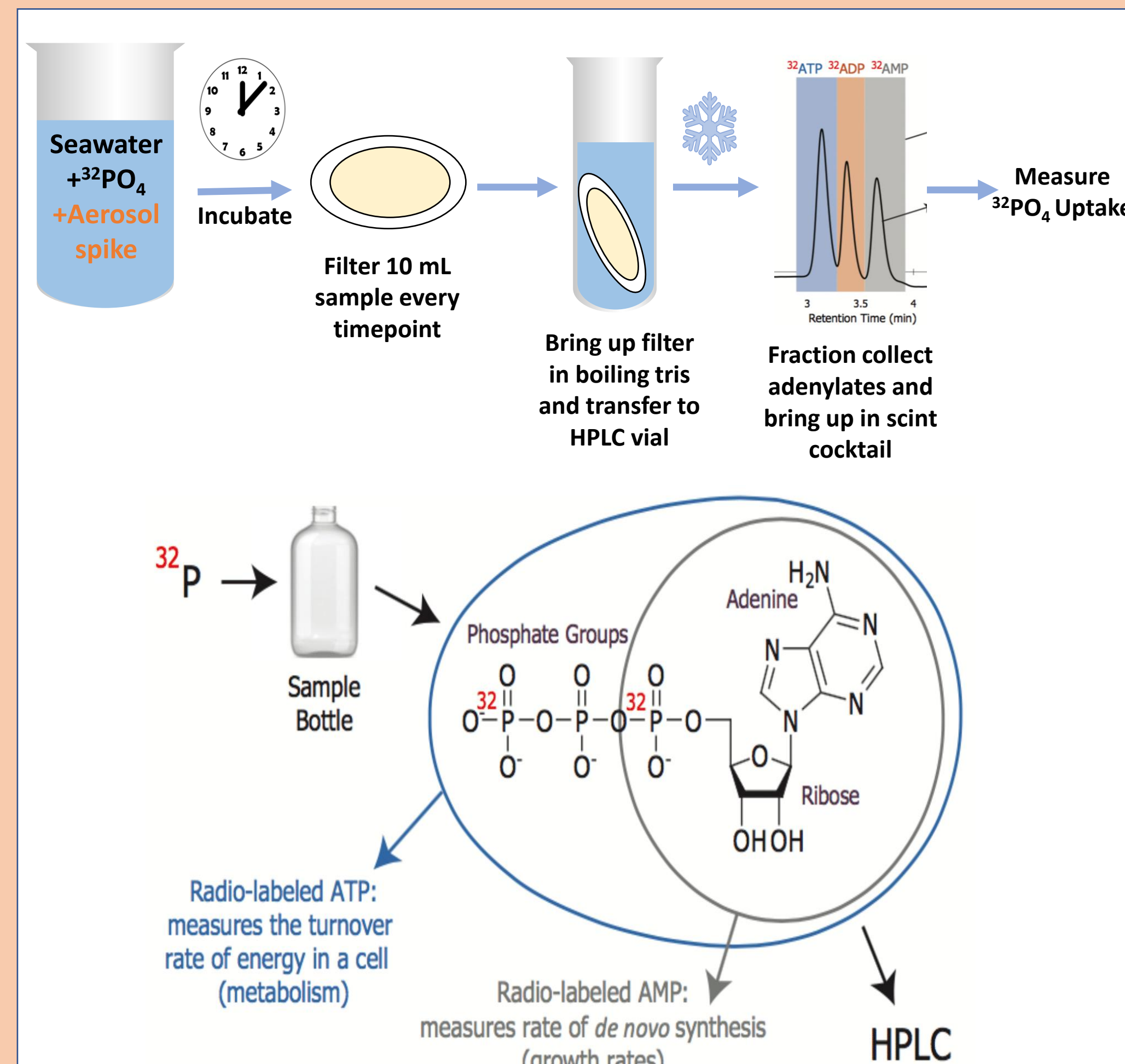
## Questions:

Do atmospheric deposition events serve as a source of BAP?  
Does the aerosol source (dust or BBA) impact bioavailability?

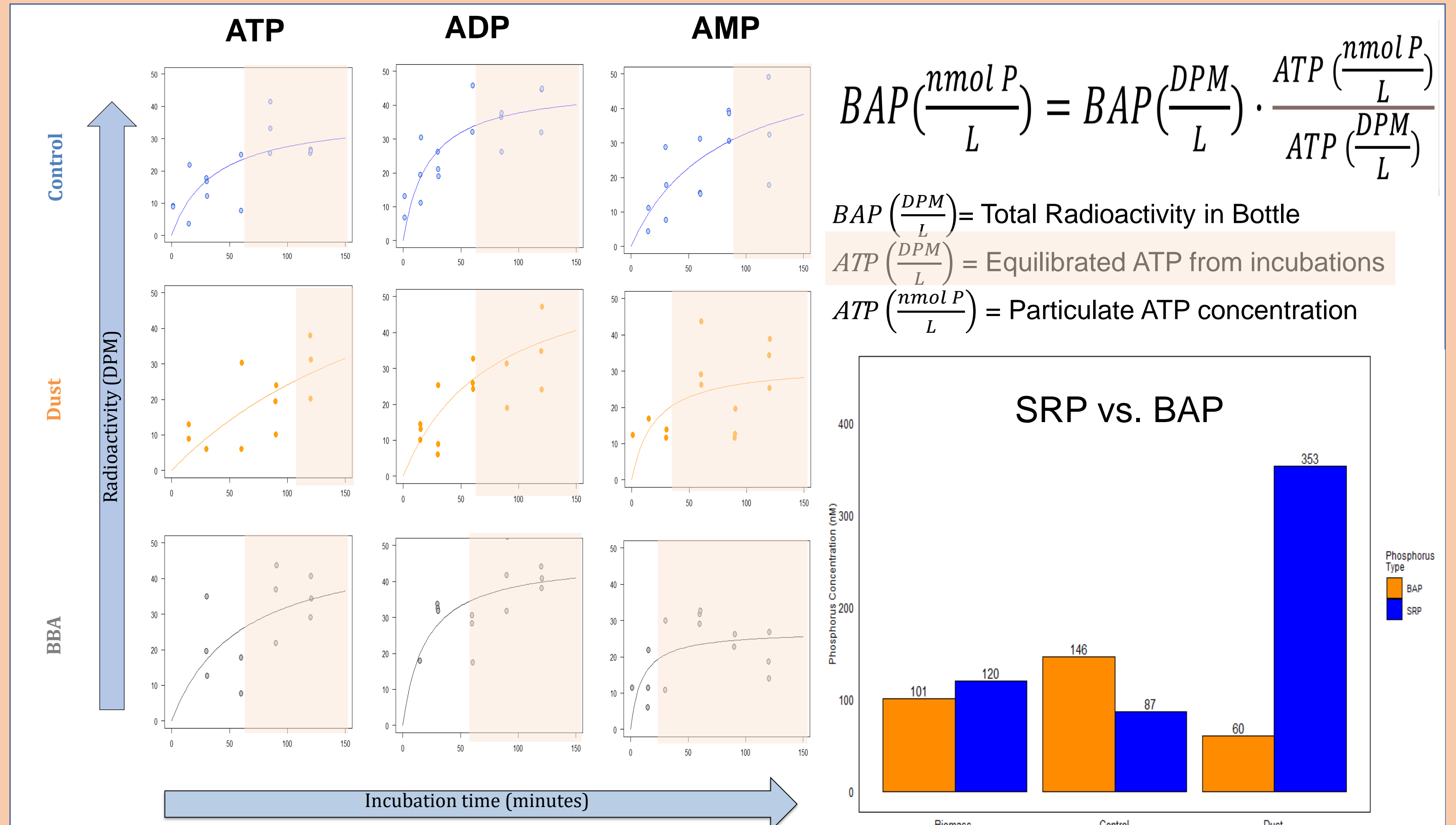
## Environmental Data<sup>4</sup>:



## Adenylate Methods<sup>4</sup>:



## P Allocation within the Adenylate System:



## Conclusions:

- Dust spike had the greatest SRP, but BAP was far less than SRP. Dust is not a great source of BAP. BBA spike had a slightly elevated SRP, and BAP was approximately equal to SRP. BBA is a decent source of BAP, and SRP method can be used as a proxy for BAP. Control had the lowest SRP, and highest BAP. BAP calculation provides qualitative information.
- Turnover time for dust was far greater than the control, and turnover time for BBA was comparable to the control. P uptake rate and production rate for dust were significantly greater than the control. P uptake rate for BBA were also higher than the control, but not as drastically as dust. Dust could be providing other nutrients alongside P (such as iron) to stimulate growth and enhance the production rate
- Deposition events do serve as a source of nutrients, and aerosol source matters**

## Acknowledgements:

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<sup>1</sup>Elser, James (2007), <sup>2</sup>Barkley, Anne (2019), <sup>3</sup>Karl, 1985, <sup>4</sup>Lanpher, Kaycie (2021)