

# Distribution of Thiamin and Pyridoxine in the Western Tropical North Atlantic (WTNA) Amazon River Plume



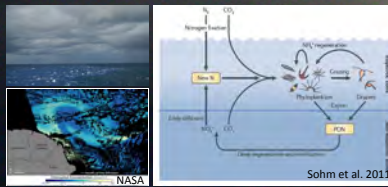
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## Introduction

The WTNA Amazon River Plume:

- Largest discharge - 18% of all riverine input into the oceans
- Can cover up to 20% of the WTNA
- CO<sub>2</sub> sequestered 2.3 Tmol C yr<sup>-1</sup> (Subramaniam et al. 2008)



## B vitamins

- Limit or Co-limit biomass (Panzeca et al. 2006)
- Influence species succession (Gobler et al. 2007)
- Vitamin auxotrophy (Croft et al. 2006, Tang et al. 2010)
- Essential co-enzymes

### Thiamin (B<sub>1</sub>)

- Pivotal role in carbon metabolism
- Acetohydroxy acid synthase: Branch chain amino acid biosynthesis
- Transketolase: Calvin cycle

### Pyridoxine (B<sub>6</sub>)

- Catalyze a wide variety of biochemical reactions with over 160 distinct catalytic functions (Percudani and Peracchi, 2009)
- Transamination: breaks down amino acids
- Transulfuration: methionine -> cystine

Table 1 Genomic characterization of SAR11 (Phage) and SAR86 (SAR86) Dupont et al. 2011

SAR86 clade	Phage/SAR86		A	B
	HTCC2380	HTCC2381		
Vitamin B <sub>12</sub> biosynthesis	No	No	No	No
B <sub>12</sub>	No	No	No	No
Thiamine	No	No	No	No
Carotenoid (retinal)	Yes	Yes	Yes	No
Flavin	Yes	Yes	Yes	No
Biotin	No	No	No	No
Proteinase	No	No	No	No

## Objectives

- First vitamin profiles in Amazon Plume
- Investigate riverine sources of vitamins to WTNA ocean
- Influence of vitamins B<sub>1</sub> and B<sub>6</sub> on carbon and nitrogen cycling

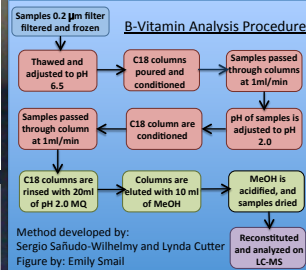
## Acknowledgements

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## Hypotheses

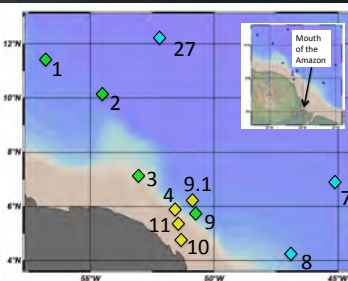
- The Amazon River Plume provides a source of vitamins to the WTNA
- Bacterial community provides a secondary source of vitamins
- B vitamins limit carbon and nitrogen fixation

## Methods

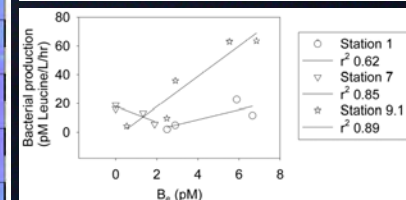
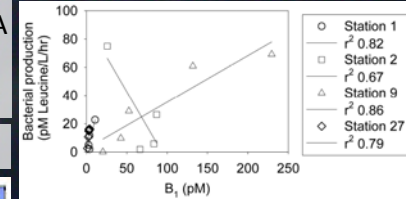


Station #	Sea surface salinity (psu)	Station group
1	31.9	Mesohaline
2	33.1	Mesohaline
3	31.4	Mesohaline
4	21.9	Low Salinity
7	35.9	Oceanic
8	35.6	Oceanic
9	32.8	Mesohaline
9.1	27.3	Low Salinity
10	24.4	Low Salinity
11	22.8	Low Salinity
27	36	Oceanic

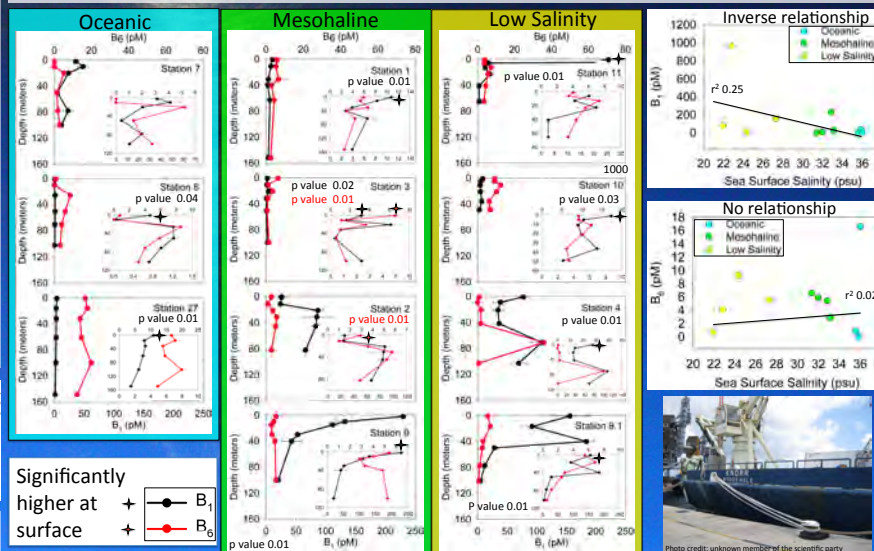
## Stations



## Relation to Bacterial Production



## Results



## Conclusions

- Vitamin B<sub>1</sub> and B<sub>6</sub> are highly variable in the upper 80 meters of the water column, which corresponds to the area of high biological productivity

B Vitamin	Concentration range (pM)	Relation to SSS	Relation to C fixation	Relation to N fixation	Relation to bacterial production
B <sub>1</sub>	5 - 1000	Inverse	Positive	Positive	Positive
B <sub>6</sub>	N/D - 70	Neutral	Neutral	Positive	Positive

The lowest half-saturation constant for vitamin B<sub>1</sub> dependent growth rates is 5.94 pM (Tang et al. 2010), which is at the lower range of concentrations measured in the WTNA suggesting B<sub>1</sub> may be a limiting factor for growth

Subsurface maximums observed at depths between 20 and 70 meters

## Take home message

- Highly variable Environment distribution
- B<sub>1</sub> and B<sub>6</sub> vitamins
- Vitamins play a role in C and N cycling

## References

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