Spatiotemporal Variability of N-cycling in the Guana Estuary

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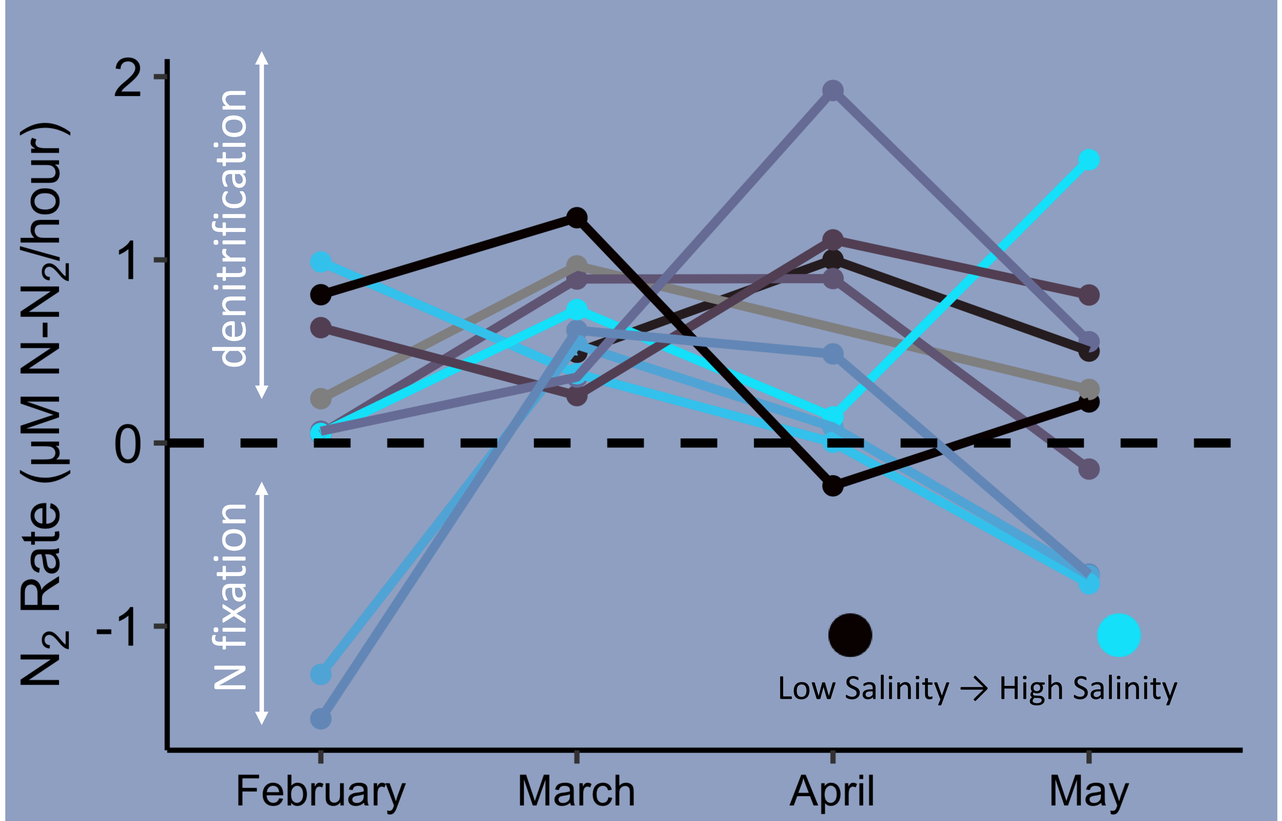
Introduction

- Guana Estuary (GE) at the Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERRS) is a popular local site for recreation and fishing
- Anthropogenic development has increased N loading and eutrophication
- Denitrification and N-fixation mediate cycling and availability of N in biosphere
- Relative importance of one pathway compared to the other can be driven by factors such as salinity, temperature, organic matter, and nutrient availability
- Understanding the relative importance and environmental drivers and regulators of each pathway can improve our understanding and management of N cycle in the face of increased N inputs

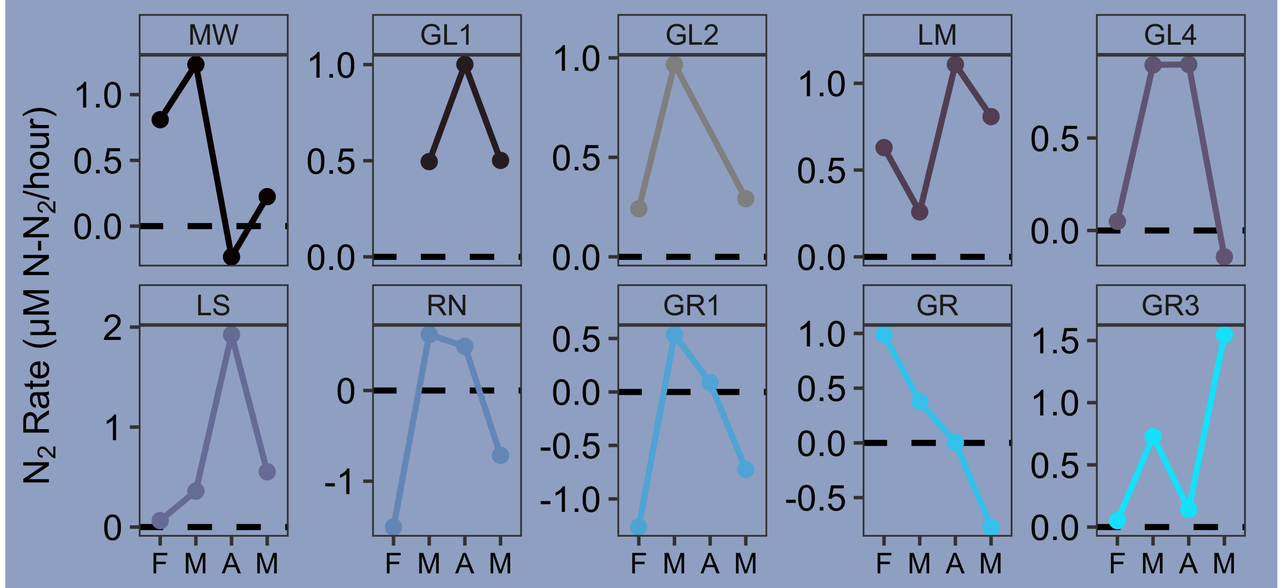
Methods

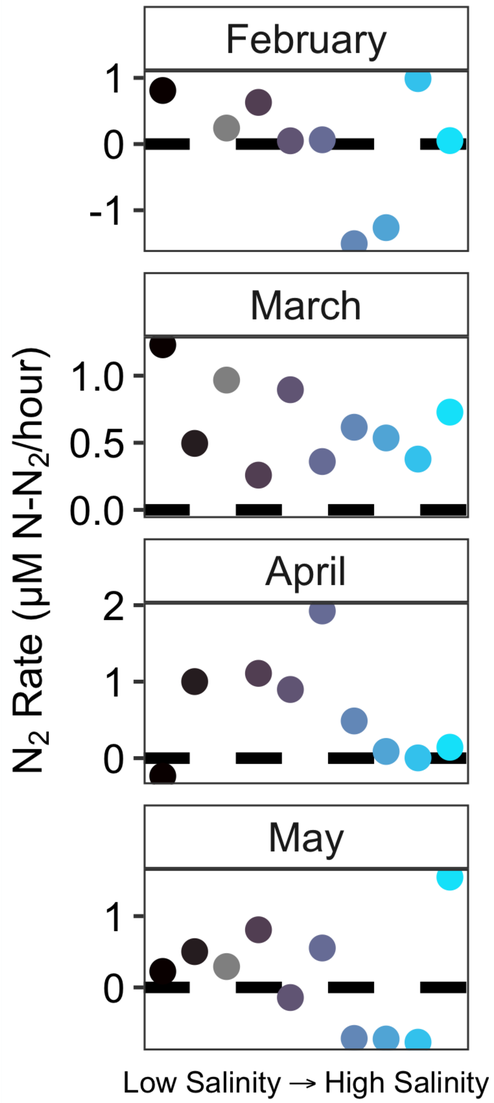
- Monthly N_2 sediment slurry incubations conducted from January 2022 to January 2023 using sediment from 10 sites in the GE (Figure 1)
- N_2 flux is estimated by measuring N_2 concentrations and quantifying the production of N_2 gas over the course of the incubation

Figure 1: GE sampling sites. Salinity decreases from 0.38 ppt (north at Mickler's Weir) to 35.06 ppt (south at Guana River 3)



Net N_2 rates vary spatially and temporally along a salinity gradient





- **General decrease along salinity gradient over dry season months**

Discussion

- N_2 rates show extreme variability within sites, among sites, and over time
- River sites show linear decrease in rates since March; lake sites do not
- Currently no evidence for a dry season hot spot or hot moment
- Preliminary results suggest a shift from N-fixation to denitrification along an increasing salinity gradient
- By quantifying drivers and spatiotemporal variability of net potential N2 flux, we can develop strategies to manage N and protect water quality and ecosystem services provided by the Guana Estuary

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