Chamber-Based Estimates of Methane Production in Coastal Estuarine Systems in Southern California

Brian Brigham1*, Chun-Ta Lai1, David Lipson1, and Johan Six2

1Department of Biology, San Diego State University, San Diego, CA; 2Department of Plant Sciences, University of California, Davis, Davis, CA

*Corresponding authors: bbrigham@sunstroke.sdsu.edu

Introduction

Natural wetland systems produce a significant portion of global methane emissions. Methane is a trace gas comprising less than 0.1% of the atmosphere, but it is disproportionately responsible for the global warming effect. Natural wetlands store large amounts of carbon. However, the production of methane from these systems can reduce or mitigate the effect of wetlands' carbon storage capacity.

Here we investigated the rates of methane flux in two coastal wetlands near San Diego – the Tijuana River National Estuarine Research Reserve, and the Torrey Pines State Park Estuary. To elucidate which factors regulate methane gas production, we measured salinity, pH, temperature, redox potential, soil nitrogen content, and dissolved organic carbon. In this study it was found that both wetland systems were potential sources of methane. The level of salinity measured was correlated with methane flux. Thus, brackish sites had higher methane emissions than salty sites.

Method

Methane measurements
- Gas samples were analyzed with gas chromatograph equipped with an FID detector
- Concentrations were determined by fitting results to a standard curve created with a methane standard (1500 ppb)

Soil/water measurements
- Soil samples were extracted with 2M KCL buffer
- Supernatant analyzed with a U.V. spectrometer
- Soil nitrite, nitrate, and ammonia concentrations were determined
- Soil water samples were analyzed for dissolved organic carbon

Results (continued)

• Torrey Pines and Tijuana River Estuary wetlands are potentially large sources of methane
• Salinity levels may dictate different levels of methane flux observed
• Sulfate reduction is more favorable than carbon dioxide reduction
• Sulfate typically acts as an inhibitor of methanogenesis
• This results in higher methane production in lower salinity conditions
• There was no correlation between methane production and ammonia concentrations
• Nitrate/Nitrite was undetectable in almost all samples due to the highly reduced environment

Future Research Questions:
- What is the relative importance of physical, chemical, and biological factors on the regulation of greenhouse gas flux?
- How do seasonal pollution events impact the rates of methane and nitrous oxide flux?
- What is the active role of coastal plants in methane and nitrous oxide emissions?

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