Assessment of Soil Greenhouse Gas Fluxes Along a Salinity Gradient in the Coastal Deltaic Floodplain of Louisiana

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Introduction

- Salt marshes are potentially a source of methane (CH_4) and nitrous oxide (N_2O).[1]
- Climate change and human activities are threatening these ecosystems, with unclear implications for greenhouse gas (GHG) emissions.[2]
- Estuarine marshes in the Louisiana Delta have been negatively affected by the relative rise in sea level and changes in river discharge, which have led to significant seasonal shifts in salinity.[3]

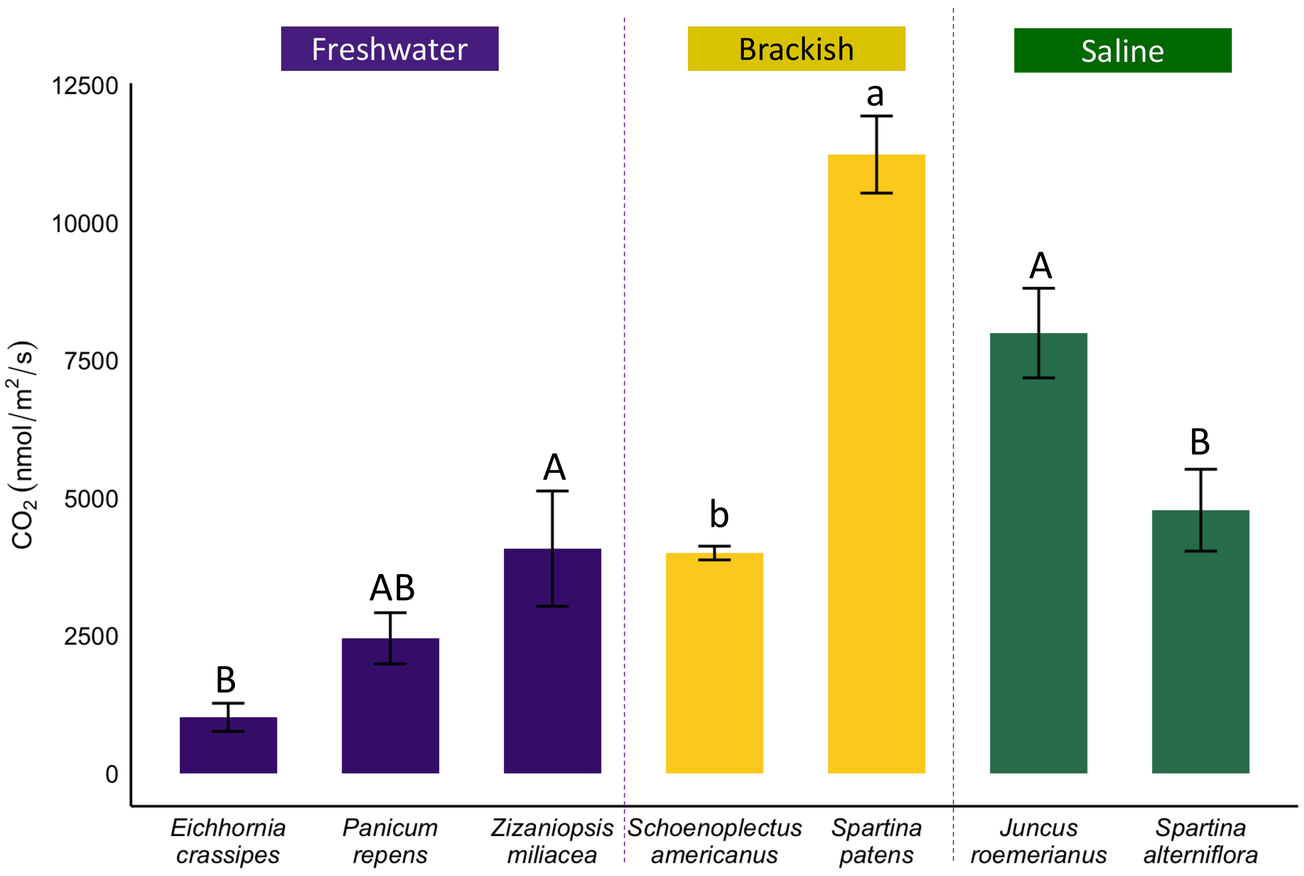
Objective

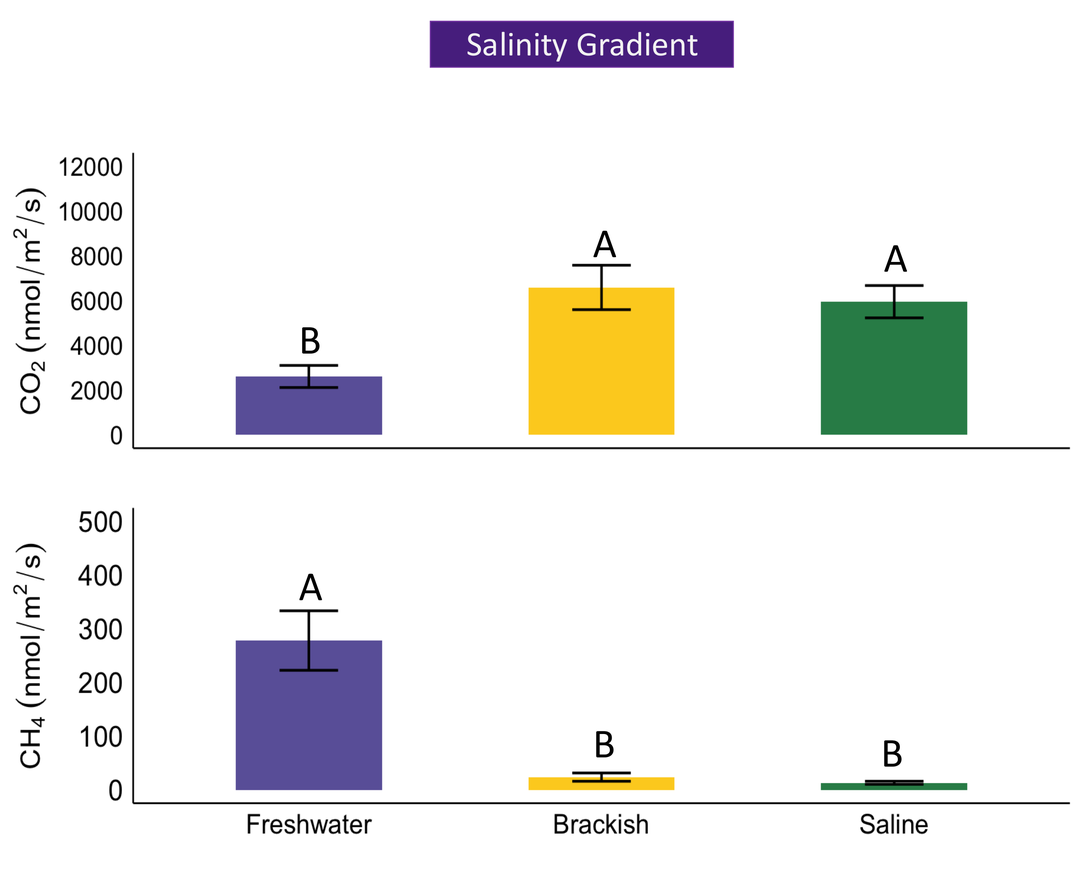
To assess the fluxes of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) across a salinity gradient (brackish, saline, and freshwater) and among different vegetation types at three sites.

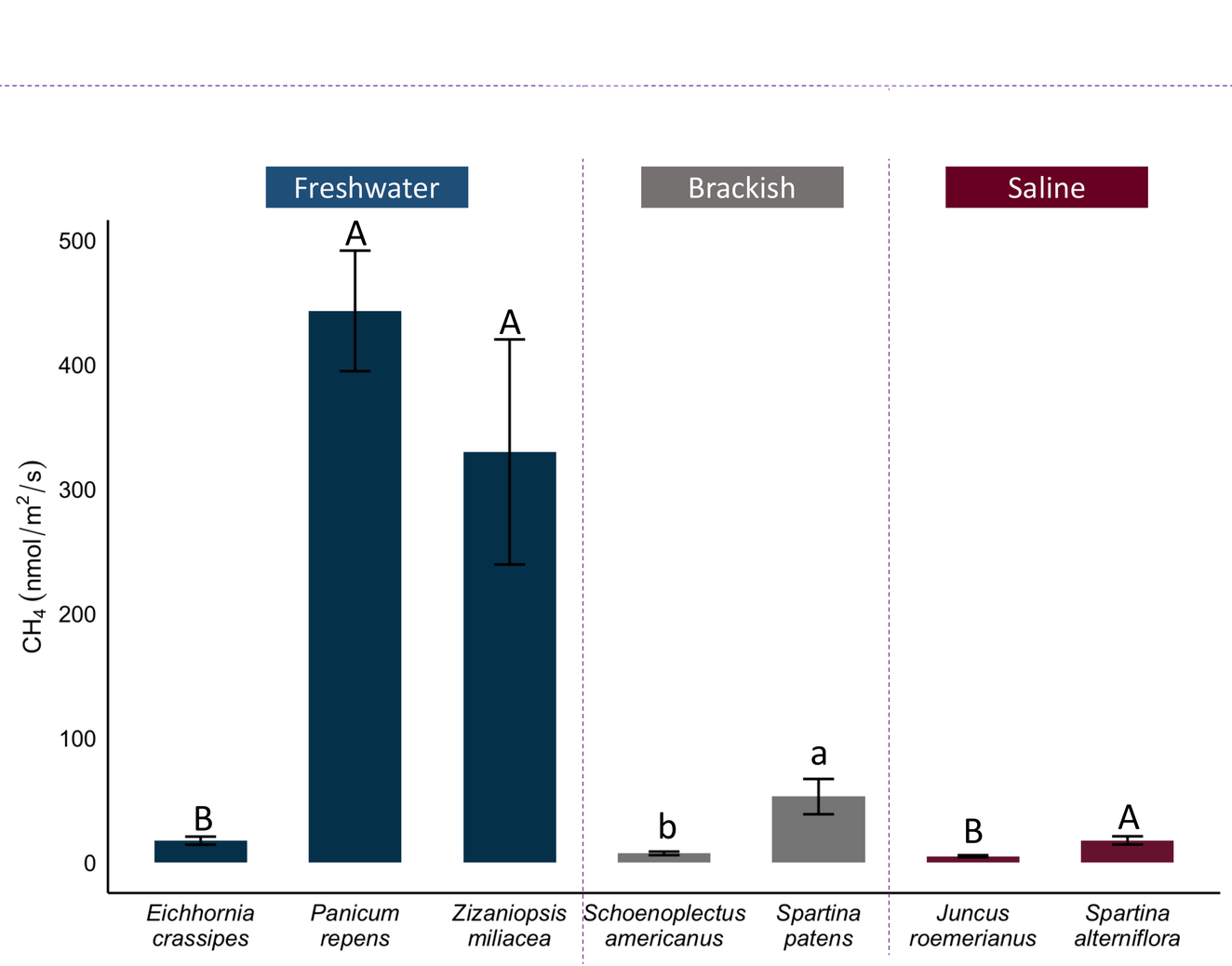
Methodology

- The study sites included:
  - Wax Lake Delta/Mike Island for:
    - Freshwater
  - Fourleague Bay for:
    - Saline (> 20 ppt)
    - Brackish (~4 ppt)
- Soil gas fluxes are measured using a chamber and trace gas analyzer (LI-COR).
- Monitored parameters included:
  - Microbial communities
  - Organic matter
  - Water level
  - Pore water
  - Nutrients
  - Redox
- The experimental design will be a Repeated Measures Design (RMD) with an ANOVA ($p < 0.05$).

Initial Insights







Implications

Climate change impacts on precipitation patterns in the upper Mississippi River Basin may significantly affect CH_4 fluxes and greenhouse gas (GHG) production in the coastal deltaic floodplains of the active Mississippi River Delta. Thus, CH_4 fluxes are expected to increase with greater river discharge as salinity decreases.

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