Improved "Blue Methane" Mapping for the United States

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Science Question

- Mapping methane and understanding the processes behind its formation are important for climate action in tidal wetlands, aka 'blue carbon' ecosystems.
- We sought to determine 1. what the dominant spatial scales of variability of porewater methane concentration, and 2. what are its major predictors and proxies?

Analysis: A team of 46 researchers led by the Smithsonian, teamed up during the height of COVID-19 to remotely collaborate, collecting soil porewater samples from 27 sites across the U.S., and using a standardized spatially stratified sampling strategy.

Results

- Methane concentration varied most between sites, and along within-site gradients, less so among relative fine spatial scales.
- Sulfate concentration was the dominant predictor of porewater methane concentration.
- We documented a newly observed threshold possibly indicating effects of sulfate concentration on microbial competition for carbon sources and methane oxidation.
- Salinity is a significant proxy for sulfate concentration.

Significance:

- The study clarified that the resolution of satellite remote sensing is appropriate for scaling up ground-based data.
- Results showed robust relationships between salinity and methane concentration across diverse sites, which will improve predictive models and maps, ultimately incentivizing habitat restoration and improving greenhouse gas accounting

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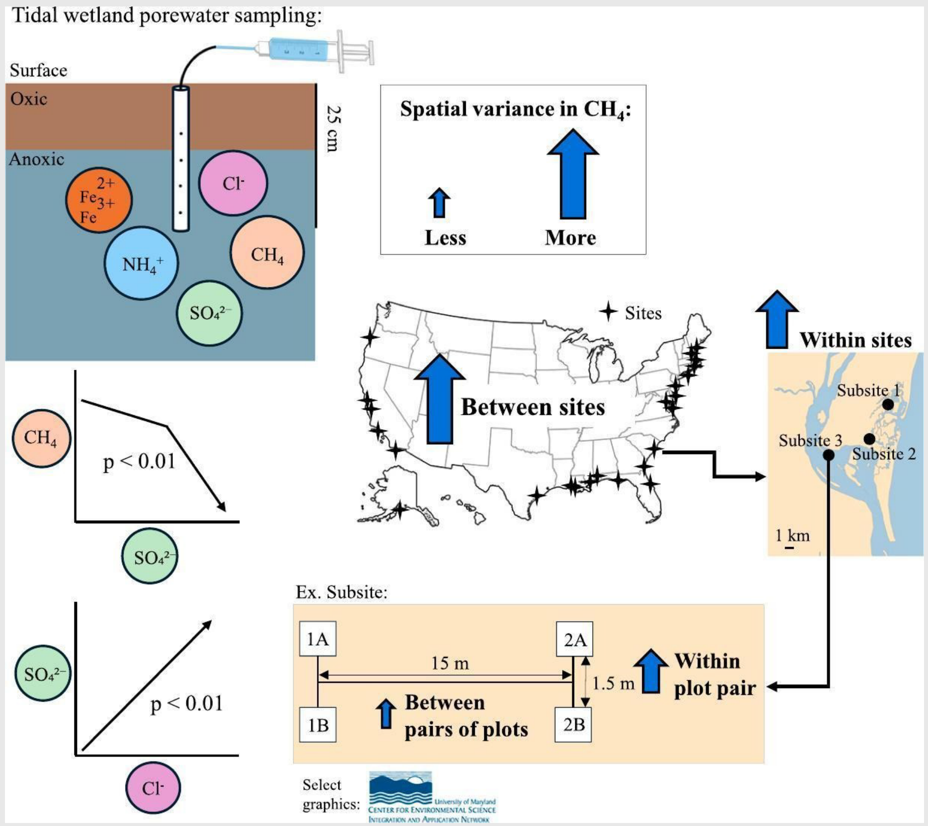

Figure: Tidal wetland porewater was sampled consistently across 27 diverse sites in the U.S. Between-site differences and within-site gradients were the dominant spatial scales of methane variation. Sulfate concentration was the dominant predictor, and salinity was a significant proxy.