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The response of greenhouse gas fluxes and nutrient filtration potential to increases in temperature and nutrient loading from salt marsh soils across a climatic gradient

Sophie Comer-Warner[1], Sami Ullah[1], Camille Stagg[2], Tracy Quirk[3], Christopher Swarzenski[2], Ashley Bulseco[4], and Gail Chmura[5]

[1]University of Birmingham, UK
[2]United States Geological Survey, USA
[3]Louisiana State University, USA
[4]The Ecosystem Center, USA
[5]McGill University, Canada

Salt marshes sequester large amounts of "blue carbon" helping to mitigate climate change. This negative climate feedback, however, may be partially offset by increases in emissions of the potent greenhouse gases (GHGs) CH_4 and N_2O from marsh soils, which some studies have shown to vary with temperature, nutrient availability and vegetation zones. Additionally, these ecosystems may have the capacity to remove reactive nitrogen potentially reducing nutrient pollution in coastal zones. Salt marshes of the northern Northwest Atlantic are typically vegetated by *Spartina alterniflora* at the lowermost elevations and *Spartina patens* at higher elevations. On the Mississippi Delta, in the northern Gulf of Mexico, *Spartina alterniflora* is typically found in the most saline marshes, whereas *Spartina patens* is found at slightly lower salinities. We evaluated the response of GHG production and denitrification to elevated temperature and nutrients through laboratory incubations of intact soil cores. Cores were collected from *Spartina patens* and *Spartina alterniflora* zones in the St. Lawrence River estuary, Quebec and in the Barataria-Terrebonne Basin, Louisiana, areas with distinctly different climates. We used $^{15}N\text{-}NO_3^-$ and $^{15}N\text{-}NH_4^+$ tracers to partition the sources of N_2O produced by denitrification and nitrification, respectively, as well as total N_2 production by denitrification using the ^{15}N-GAS Flux method. We also measured potential fluxes of CH_4, N_2O and CO_2. Incubation experiments were performed under ambient conditions and with elevated temperature and nutrient conditions. Different environmental conditions between vegetation zones and climatic regions are expected to result in different fluxes of CH_4 and N_2O, and rates of denitrification. Elevated temperature and nutrients are expected to increase GHG fluxes, however, it is unclear how net N_2 production, as a remedy for nitrate attenuation in marshes, will respond. Our aim is to increase our understanding of the impact of increased temperature and nitrogen loading on nitrogen removal capacity and the GHG climate feedback in different vegetation zones of salt marshes of two climatic regions.