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

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Estuarine marshes are important ecosystems because they provide ecological services to human beings, such as carbon storage and sequestration, and water filtration. Despite this, salt marshes are potentially a major source of methane (CH_4) and nitrous oxide (N_2O). Climate change and human activities are threatening these ecosystems with unclear implications for greenhouse gas (GHG) emissions, specifically on the Louisiana coast. Estuarine marshes in the delta have been negatively affected mainly by the relative rise in sea level and alterations in river discharge, with significant seasonal shifts in salinity. We are assessing the fluxes of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) along a salinity gradient (brackish, saline, and freshwater) and including different types of vegetation in three sites during a year. The sites were selected to represent freshwater and saline endmembers, with a mid-salinity site that varies above and below 4 ppt salinity. The freshwater site is Wax Lake Delta, the saline site at Old Oyster Bayou (> 20 ppt), and the brackish site in mid-Folleague Bay (~4 ppt). Soil gas fluxes are measured with a chamber and trace gas analyzer (LI-COR). In addition to the fluxes of the three gases, sediment temperature and redox, water level, pore water, organic matter, and nutrients are monitored. The experimental design of this study is a Repeated Measured Design (RMD). We hypothesize that fluxes on the sites and vegetation will vary over the seasons based on river discharge. To test these hypotheses, an ANOVA will be applied with repeated measurement over time. Fluxes of CH_4 will be higher with greater river discharge as salinities decrease. The implications will be that climate change impacts on precipitation patterns in the upper Mississippi River Basin may have a significant impact on the CH_4 fluxes and GHG production in coastal deltaic floodplains of the active Mississippi River Delta.