EC1 GHG analysis methods

**Sample collection:** Soil and sediment samples used in this study were collected as part of the first campaign of Exploration of Coastal Hydrobiogeochemistry Across a Network of Gradients and Experiments (EXCHANGE), a sub-project of the US Department of Energy-funded Coastal Observations, Mechanisms, and Predictions across Systems and Scales (COMPASS) project. EXCHANGE is a crowd-sourced sampling program consisting of a consortium of scientists. All samples were collected by hand from the top several cm of the soil/sediment profile by hand, transferred to plastic bags, then shipped on ice overnight to the lab. Upon arrival, we flushed samples with N2 gas to create anoxic environment prior to experiments.

**Inundation:** To quantify the consumption/production of oxygen and greenhouse gases, we conducted rapid (24-hour duration) inundation incubation experiments with seawater. We limited incubation time to 24 hours to capture the initial response of soils/sediments after inundation. For each sample, we filled six combusted (550º C) amber borosilicate glass scintillation vials with gas-tight septum caps with ~5g of field-moist soil/sediment. The six vials formed two sets of triplicates: one set which was flushed with N2 gas and then incubated for 24 hours (labeled “dry”) and the other set was flushed with N2 gas, then inundated with room-temperature seawater (labeled “wet”) and homogenized by hand.

**Analysis:** After 24 hours, we sampled greenhouse gases. Gases for dry treatments were collected directly from the headspace in each vial, while gasses for wet treatments were extracted from 20 mL of water. Gas concentrations were measured using a Picarro gas analyzer. To correct for gas concentrations in seawater, we also analyzed seawater samples for each experiment, and subtracted from corresponding wet treatment gas concentrations. We converted any negative concentrations after seawater subtraction recorded to 0.