Tidal Restriction Leads to Enhanced Methane Emissions in Tropical Australia

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Abstract

In Queensland, tidal restriction of coastal wetlands alters their hydrological connection and creates freshwater-impounded wetlands, increasing methane emissions. We investigated greenhouse gas emissions from tidally restricted wetlands and compared them with adjacent tidally connected wetlands (saltmarsh and mangroves). Furthermore, we investigated the influence of seasons and soil physicochemical parameters on greenhouse gas emissions. Tidal restriction leads to significantly higher methane emissions compared to natural coastal wetlands. Soil redox, carbon density, nitrogen density and moisture were all significantly correlated to methane emissions. Seasons influenced greenhouse gas emissions, with higher emissions in summer. Overall, tidally restricted wetlands were emitting 2175 mg $CO_{2-eq}.m^2.d^{-1}$, two orders of magnitude higher than tidally connected wetlands which emitted 18 mg $CO_{2-eq}.m^2.d^{-1}$. This research is supporting tidal restoration in Queensland as a cost-effective strategy to mitigate climate change as it has the potential to enhance blue carbon burial rates and avoids long-term emissions of methane.

Keywords: tidal restriction, coastal wetlands, methane, tidal restoration, soil indicators

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