Tropical Storms, Sea-level Rise, and Drawdowns Affect Carbon Accumulation and Elevation Gain in Coastal Marshes

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Coastal wetlands can offset some subsidence and sea level rise via vertical accretion. We used 137Cs dating to compare 55 years of accretion between an impounded marsh and an un-impounded marsh in coastal Louisiana. The un-impounded marsh had five times more accretion. In the un-impounded, accretion was related to organic accumulation whereas mineral accumulation was related to bulk density. In the impounded marsh, accretion was related to mineral accumulation and bulk density. We attributed those differences to managed prolonged drainage events since ~2005 in the impounded marsh that we studied.

We compared our estimates to earlier 33-year estimates using 137Cs from the same un-impounded marsh. Those estimates were slower for accretion, mineral accumulation, and organic accumulation. We estimated that accretion would have had to accelerate 68%, organic accumulation had to accelerate 11%, and mineral accumulation had to accelerate 7-fold after 1998 for us to observe the rates that we estimated. We attributed those differences to increases in flooding by tides and/or tropical storms since 2000.

We also compared our estimates to earlier 33-year estimates using 137Cs from two nearby impounded marshes. Impoundment effects varied widely, which precludes broad statements about effects of impoundment on accretion. None-the-less, evidence is accumulating that Moist-soil management on organic soils in the coastal zone compromises accretion processes and reduces elevation via soil organic matter oxidation and compaction. New research is suggested on highly organic soils to identify plant species that foster accretion, and fire and water level management that promotes those species.