Climate Change and the Resilience of Tidal Wetland Carbon Sequestration

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Abstract. C sequestration of plant-derived organic matter in sediments of coastal wetlands is about 70 – 220 Tg C/y. While the expanse of these systems is small globally, areal rates of C burial are among the highest of Earths ecosystems. However, this globally relevant ecosystem service is highly vulnerable to climate and land use change. Sea-level rise (SLR) will likely increase rates of shoreline erosion, reversing a several thousand year trend in progradation. Transgression will likely slow as a result of coastal armoring to protect upland uses of higher local value. Increased rates of SLR may compromise the ability of tidal wetlands to accrete vertically, which would result in inundation, loss of area and decreased C sequestration. Simulation results suggest an optimal rate of SLR for a given tidal range and suspended sediment availability beyond which wetland survival is compromised. Differential warming effects on respiration relative to primary productivity will likely lead to reduced net ecosystem production and decreased C burial potential in the future. Considerable research is needed to better understand the relationships between wetland resilience and global change.