Global Review of Salt Marsh Change and Carbon Emissions

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Salt marshes are carbon dense coastal wetlands occurring globally. Historic and current salt marsh change is highly uncertain. The Landsat satellite record has enabled global scale change analysis of the last 40 years but has limitations. We aimed to understand carbon emissions from Land Cover Land Use Change (LCLUC) in salt marsh environments. Our previous work estimated global carbon emissions from salt marsh ecosystems from 2000-2019. We utilized the Landsat archive and Google Earth Engine to map change anomalies, including loss, gain, and recovery within the global salt marsh extent from 2000-2019. We estimated soil organic carbon at 1 m using the Coastal Carbon Atlas and assumed complete loss of that top meter. In that work, we estimated that net global losses resulted in 16.3 (0.4-33.2) Tg CO2e year−1 emissions from 2000 to 2019. Following that work, new regional and global maps of extent, change, soil organic carbon, and aboveground biomass have been published. These new datasets can improve our estimates of salt marsh extent, change, and emissions. Therefore, we present these advances in salt marsh mapping and their impact on modeling carbon emissions. We analyze the variability of these change mapping approaches in the Chesapeake Bay, exploring how the mapping approach affects carbon emissions. Finally, we highlight local approaches that could constrain carbon emission estimates from salt marsh change, including identifying the loss process and classifying plant functional communities with imaging spectroscopy. Remote sensing is critical for improving our understanding of the extent and change of the salt marsh ecosystem. Remote sensing is essential for monitoring salt marsh ecosystems. Methods are ready for implementation in global reporting frameworks such as Nationally Determined Contributions, the Kunming-Montreal Global Biodiversity Framework, and Sustainable Development Goals.