

Carbon Speciation and Concentration in California Salt Marsh Surface Waters Under Varied Land Use History and Management Regimes

ALIYA KHAN, DEVON BAKER-BERRY AND ADINA
PAYTAN

University of California, Santa Cruz

Blue carbon ecosystems (BCEs), including saltmarshes, mangroves, and seagrasses, are important carbon (C) sinks, sequestering nearly half of the organic C buried in the ocean, despite covering only about 2% of the ocean area. The carbon sequestration capability of these systems is largely attributed to organic matter preserved in sediments. However, there is increasing evidence of previously unquantified C in the form of lateral (or hydrologic) fluxes – carbon that is exported from BCEs to the ocean via surface water. In salt marsh carbon budgets up to 47% of the carbon remains unaccounted for; this "missing" C flux is hypothesized to be in the form of lateral transport. The quantity of these lateral C exports often exceeds burial quantity highlighting the significance of understanding this C pathway.

The study took place at the Elkhorn Slough, the second largest tract of tidal salt marsh in California, surface water samples were collected hourly for 24 hours at 5 sites within the slough (pristine, restored, impounded and freshwater) and analyzed for their inorganic carbon, total alkalinity, organic carbon, and both labile and refractory particulate C. These data were used to constrain the concentration, speciation and quality of C present in surface water and groundwater entering and leaving each site. The study aimed to capture both spatial and temporal variability in C species concentrations and relative contributions of surface water and groundwater to overall C lateral flux. This project will enable our team to assess the effect of land use type and marsh management in affecting lateral C flows, and help close the C budget in west coast wetlands, a globally understudied BCE region. Additionally, understanding the speciation of the C is critical to knowing its fate in terms of potential for long-term sequestration in the ocean. The scope of the study both geographically and temporally makes it one of the most extensive and comprehensive studies of lateral C to date, and the first study to collect data on all C species at a site monitored by eddy covariance towers and where subsurface C dynamics are monitored.