Flow and short- and long-term carbon dynamics at tidally impacted coastal interfaces in the SE USA

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The coastal region forms a complex and dynamic transition zone, connecting the terrestrial and the oceanic environment. Here, we report on flow and carbon dynamics in tidally-impacted saltmarsh and freshwater marsh/riverine settings near the mouth of the Altamaha River (GA, USA). We determined the magnitude and timing of groundwater flow into a tidal river over spring-neap periods using radon as a tracer. This quantification revealed a positive correlation between the extent of marsh flooding and groundwater discharge and provides a foundation for estimating subsurface nutrient fluxes. To constrain carbon fluxes and evaluate the type of carbon moving to the coastal zone, we also assessed the organic composition of both surface and subsurface waters in the fresh yet tidally impacted reaches of the Altamaha River, spanning several tidal cycles; this revealed limited tidal variations in the size and chemistry of carbon pools in surface and pore waters, and surprisingly small differences in carbon chemistry between surface and pore water. Such observations over tidal cycles are complemented by studies of seasonal carbon dynamics, and by the quantification of marsh plant productivity from satellite imagery and correlation with soil conditions determined by process-based modeling over decadal timescales. The latter revealed an overall decrease in marsh biomass over time. Together, these studies expand our understanding of carbon processing in the land-ocean transition zone and its temporal variability.