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Hydrological, biogeochemical, and ecological linkages at the land-sea margin: Insights from a coastal critical zone network

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Ghost forests and abandoned farms are stark indicators of ecological change along world coastlines, caused by sea level rise (SLR). These changes adversely affect terrestrial ecosystems and economies, but expanding coastal marshes resulting from SLR also provide crucial ecosystem services such as carbon sequestration and mediate material fluxes to the ocean. A US-NSF Critical Zone Network project was designed to understand the hydrological, ecological, geomorphological, and biogeochemical processes that are altering the functioning of the marsh-upland transition in the coastal critical zone. We have instrumented six sites in the mid-Atlantic region of the US, along the coastlines of the Atlantic Ocean, Delaware Bay, and Chesapeake Bay where marshes are rapidly encroaching into forests and farmland. Field observations, laboratory experiments, and modeling are revealing the drivers and impacts of coastal change, as well as feedbacks among competing processes that accelerate or reduce rates and magnitude of change. We discuss examples of processes and feedbacks and highlight the importance of interdisciplinary exploration and synthesis in advancing process understanding at the land-sea transition.