External mechanisms driving ecosystem changes in a coastal wetland, the Mississippi Delta, USA

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Abstract

The world's most extensive and active deltas, Louisiana's wetlands, are deteriorating rapidly due to multiple stressors such as the discharge of the Mississippi River, sea-level rise, and coastal retreat, the substantial but spatially and temporally variable impacts. However, the ecological and anthropogenic histories, the mode of environmental changes on a multi-millennial timescale have not been thoroughly documented. This study, a palynology-based multiproxy analysis, investigates hydrological, geological, geochemical, and anthropogenic impacts on southern Louisiana wetlands and a variety of external forcing agents influencing ecological succession. Sediment cores extracted from a small pond on a mangrove-dominate island near Port Fourchon, Louisiana, USA yielded a 4,000-year record. The site has been transformed from freshwater to saline water environments, to a mangrove dominant island over the late Holocene. The multivariate principal component analysis identified the relative strength of external drivers responsible for each ecological shift. The Mississippi River delta cycle (lobe switching) was the dominant driver of ecosystem changes during the late Holocene, while relative sea-level rise, tropical cyclones, climate, and anthropogenic effects have been the main drivers late in the site's history.

Keywords : Mississippi Delta, drivers, sediment, wetland, x-ray fluorescence

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