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# Climate-related relative sea-level changes from Chesapeake Bay, U.S. Atlantic coast

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Proxy-based reconstructions of relative sea level (RSL) from the coastlines of the North Atlantic have revealed spatial and temporal variability in the rates of RSL rise during periods of known Late-Holocene climatic variability. Regional driving mechanisms for such variability include glacial isostatic adjustment, static-equilibrium of land-ice changes and/or ocean dynamic effects as well as more localized factors (e.g. sediment compaction and tidal range change).

We present a 4000-year RSL reconstruction from salt-marsh sediments of the Chesapeake Bay using a foraminiferal-based transfer function and a composite chronology. A local contemporary training set of foraminifera was developed to calibrate fossil counterparts and provide estimates of paleo marsh elevation with vertical uncertainties of $\pm$0.06m. A composite chronology combining 30 radiocarbon dates, pollen chronohorizons, regional pollution histories, and short-lived radionuclides was placed into a Bayesian age-depth framework yielding low temporal uncertainties averaging 40 years. A compression-only geotechnical model was applied to decompact the RSL record. We coupled the proxy reconstruction with direct observations from nearby tide gauge records before rates of RSL rise were quantified through application of an Errors-In-Variables Integrated Gaussian Process model.

The RSL history for Chesapeake Bay shows $\sim$6 m of rise since $\sim$2000 BCE. Between 2000 BCE and 1300 BCE, rates of RSL increasing to 1.4 mm/yr precede a significant decrease to 0.8 mm/yr at 700 BCE. This minimum coincides with widespread climate cooling identified in multiple paleoclimate archives of the North Atlantic. An increase in the rate of RSL rise to 2.1 mm/yr at 200 CE similarly precedes a decrease in the rate of RSL rise at 1450 CE (1.3 mm/yr) that coincides with the Little Ice Age. Modern rates of RSL rise (3.6 mm/yr) are the fastest observed in the past $\sim$4000 years. The temporal length and decadal resolution of the RSL reconstruction further reconciles the response of sea levels to late Holocene climate variability.