

Spatial Variability of Late Holocene and 20th Century Sea Level Rise along the US Atlantic Coast

Simon E. Engelhart (1), Benjamin P. Horton (1), W. Richard Peltier (2)

(1) Sea Level Research Laboratory, Earth and Environmental Science,
University of Pennsylvania, Philadelphia, USA

(2) Department of Physics, University of Toronto, Toronto, Canada

simoneng@sas.upenn.edu

Accurate estimates of global sea-level rise in the pre-satellite era provide a context for 21st century sea-level predictions. The use of tide-gauge records is complicated by the contributions from changes in land level due to glacial isostatic adjustment (GIA). We have constructed a rigorously quality-controlled database of late Holocene sea-level indices from the US Atlantic Coast, exhibiting subsidence rates of less than 0.8 mm yr^{-1} in Maine, increasing to rates of 1.7 mm yr^{-1} in Delaware, and a return to rates less than 0.9 mm yr^{-1} in the Carolinas. This pattern can be attributed to ongoing GIA due to the demise of the Laurentide Ice Sheet. Our data allow us to define the geometry of the associated collapsing proglacial forebulge with a level of resolution unmatched by any other currently available method. The corresponding rates of relative sea-level rise serve as “background” rates on, which any future eustatic rise must be superimposed. We further employ the geological data to decontaminate tide-gauge records to estimate a mean 20th century sea-level rise rate for the US Atlantic Coast of $1.8 \pm 0.2 \text{ mm yr}^{-1}$, similar to the global average. However, we find a distinct trend in the rate of 20th century sea-level rise, increasing from Maine to South Carolina. This is the first evidence of this phenomenon from observational data alone. We contend this may be related to either the melting of the Greenland Ice Sheet and/or ocean steric effects.