Study shows rapid sea level rise along Atlantic coast of North America in 18th century

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The findings are based on sea level reconstructions derived from salt-marsh sediments from the Atlantic coast and from microscopic salt-marsh fossils. Credit: Prof Roland Gehrels, University of York

The study, led by the University of York, found evidence for a period of enhanced pre-industrial sea-level rise of about two to three millimetres

per year in three locations: Nova Scotia, Maine and Connecticut.

The researchers say that the large rises at these three locations were natural, and partly related to the North Atlantic Oscillation—a large-scale atmospheric pressure see-saw over the North Atlantic region—and to periods of enhanced ice melt in the Arctic.

The authors of the study say cities like New York and Boston will have to take into account this natural variability in planning for future sea level rise.

The findings are based on sea level reconstructions derived from salt-marsh sediments from the Atlantic coast and from microscopic salt-marsh fossils.

Previous studies have shown that, since the 1950s, rates of sea level rise along the Atlantic coast of North America were faster than the global average—leading to this region coming to be known as a sea level rise "hotspot."

However, lead author Prof Roland Gehrels, from the University of York's Department of Environment and Geography, said this earlier rapid episode of sea level rise in the 18th Century wasn't known before.

"To find out what global warming is doing to sea levels today we need that base level from historical times.

"In the 20th Century we see rates of up to three or four millimetres per year, faster than in any century in at least the last 3000 years.

The findings are based on sea level reconstructions derived from salt-marsh sediments from the Atlantic coast and from microscopic salt-marsh fossils. Credit: Prof Roland Gehrels, University of York

"In the 18th Century they were slightly slower, but still much quicker than you would expect for the Little Ice Age, partly because the Arctic was relatively warm during the 18th Century.

"It is pre-industrial so there are no anthropogenic forces—or human influences—at play, but in the 20th Century there may well have been.

"This means that those rapid episodes of sea level rise on the north east coast of North America in the 18th Century have a natural cause."

Scientists say salt-marshes are good "archives" of sea levels as they contain several metres of sediment which contains data going back

hundreds of years.

Prof Gehrels added: "The high rates in this "hotspot" could present significant coastal risks for large population centres if they are a persistent and recurring feature.

"The likely future sea level rise in places like New York City is expected to be considerably greater than the global average by the end of the 21st century."

"Our findings suggest that enhanced rates of sea level rise along eastern North America are not only symptomatic of human activity, but might additionally arise from natural processes in the climate system."

The findings are published in *Geophysical Research Letters* and involved collaboration with the University of Leeds; Durham University; Bangor University; the National Oceanography Centre, Liverpool; Woods Hole Oceanographic Institution, Massachusetts, USA; Old Dominion University, Virginia, USA; and the University of Siegen, Germany.

More information: W. R. Gehrels et al, A Preindustrial Sea-Level Rise Hotspot Along the Atlantic Coast of North America, *Geophysical Research Letters* (2020). DOI: 10.1029/2019GL085814

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