Fastest sea-level rise in two millennia linked to increasing temperatures

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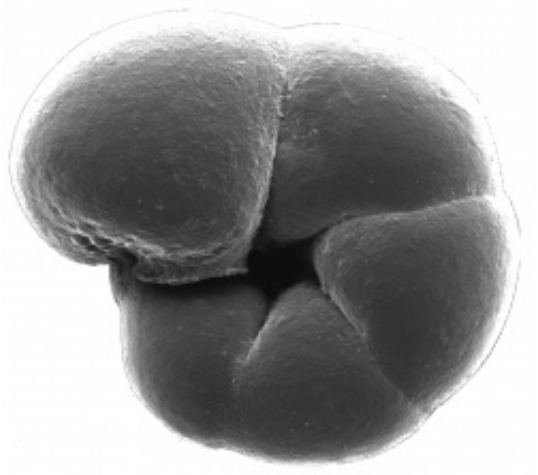

A foraminifera fossil

(PhysOrg.com) -- An international research team including University of Pennsylvania scientists has shown that the rate of sea-level rise along the U.S. Atlantic coast is greater now than at any time in the past 2,000 years and that there is a consistent link between changes in global mean surface temperature and sea level.

The research was conducted by members of the Department of Earth and Environmental Science in Penn's School of Arts and Science: Benjamin Horton, associate professor and director of the Sea Level Research Laboratory, and postdoctoral fellow Andrew Kemp, now at Yale University's Climate and Energy Institute.

Their work will be published in the journal Proceedings of the National Academy of Sciences on June 20.

"Sea-level rise is a potentially disastrous outcome of climate change, as rising temperatures melt land-based ice and warm ocean waters," Horton said.

"Scenarios of future rise are dependent upon understanding the response of sea level to climate changes. Accurate estimates of past sea-level variability provide a context for such projections," Kemp said.

In the new study, researchers provided the first continuous sea-level reconstruction for the past 2,000 years and compared variations in global temperature to changes in sea level during this time period.

The team found that sea level was relatively stable from 200 B.C. to 1,000 A.D. During a warm climate period beginning in the 11th century known as the Medieval Climate Anomaly, sea level rose by about half a millimeter per year for 400 years. There was then a second period of stable sea level associated with a cooler period, known as the Little Ice Age, which persisted until the late 19th century. Since the late 19th century, however, sea level has risen by more than 2 millimeters per year on average, which is the steepest rate for more than 2,100 years.

To reconstruct sea level, the research team used microfossils called foraminifera preserved in sediment cores from coastal salt marshes in North Carolina. The age of these cores was estimated using radiocarbon dating and several complementary techniques.

To ensure the validity of their approach, the team members confirmed their reconstructions against tide-gauge measurements from North Carolina for the past 80 years and global tide-gauge records for the past 300 years. A second reconstruction from Massachusetts confirmed their

findings. The records were also corrected for contributions to sea-level rise made by vertical land movements.

The team's research shows that the reconstructed changes in sea level during the past millennium are consistent with past global temperatures and can be described using a model relating the rate of sea-level rise to global temperature.

"The data from the past help to calibrate our model and will improve sea-level rise projections under scenarios of future temperature rise," research team member Stefan Rahmstorf said.

More information: www.pnas.org/content/early/201 … /1015619108.abstract

Provided by University of Pennsylvania