



- News
- Articles
- Videos
- Images
- Books
- Reference
- Search ...
- Go

- Health & Medicine
- Mind & Brain
- Plants & Animals
- Earth & Climate
- Space & Time
- Matter & Energy
- Computers & Math
- Fossils & Ruins

Science News

... from universities, journals, and other research organizations

- Save
- Email
- Print
- Share

New Dating of Sea-Level Records Reveals Rapid Response Between Ice Volume and Polar Temperature

ScienceDaily (Nov. 14, 2012) — A new study has revealed a rapid response between global temperature and ice volume/sea-level, which could lead to sea-levels rising by over one metre.

Share This:

Like 9

Tweet 19

2

4

During the last few million years, global ice-volume variability has been one of the main feedback mechanisms in climate change, because of the strong reflective properties of large ice sheets. Ice volume changes in ancient times can be reconstructed from sea-level records. However, detailed assessment of the role of ice volume in climate change is hindered by inadequacies in sea-level records and/or their timescales.

Now, for the first time, scientists are able to accurately date continuous sea-level records, to allow detailed comparisons of the ice-volume variability with independently dated ice-core records from Antarctica and Greenland..

Previous studies of the timing of past ice-volume changes relied on the 'Red Sea relative sea-level (RSL) record' for reconstruction of highly resolved and continuous records of sea-level variability over the past 500,000 years. The drawback of the RSL method, however, is that it did not have independent age control. This inhibited detailed comparison with other well-dated climate parameters, such as temperature or CO₂ records from ice cores.

An international team of scientists, led by Eelco Rohling, Professor of Ocean and Climate Change at the University of Southampton, has developed a new method of dating the RSL record by using Mediterranean data from radiometric (Uranium-series) dating of cave deposits. This provided a much improved timescale for the RSL record. The team was able to apply the new dating method throughout the entire last glacial cycle (150,000 years), which resulted in an unprecedented continuous sea-level record with excellent independent age control.

By comparing the ice-volume fluctuations with polar temperature reconstructions from the Greenland and Antarctica ice cores, the scientists found that changes in temperature and ice volume/sea level are closely coupled with a response time lag of only a few centuries. This timing relationship was previously unknown, and it reveals a very fast response between global temperature and ice volume/sea level.

The study also found that periods of extensive ice-volume reduction/sea-level rise were always characterised by very fast changes, of the order of one or even two metres per century sea-level rise.

Professor Rohling, who is currently based at the National Oceanography Centre Southampton but will join the Australian National University next year, says: "This is the first time that these rates could be measured for any other period than the end-of-ice age 'terminations/deglaciations'. Although it is always hard to step from palaeo reconstructions to future projections, it suggests that when significant ice-volume adjustments happen, they are rarely slow.

"Ice sheet responses to a change in climate forcing are like the responses of heavy freight trains to firing up the locomotive.

Ads by Google

LST radiators — The UK's widest range Safe heating for public locations ... > www.jaga.co.uk


Love polar bears? — View live video of polar bears and help save their arctic home. ... > www.polarbearsinternational.org


Use TuneUp Before iCloud — Organize Your Music Before You Sync For a Better iCloud Experience ... > www.tuneupmedia.com


Grit Bin Kits - Rock Salt — Suitable for Car Parks, Councils, Offices, Driveways. Buy here today. ... > wistore.co.uk/Grit-Bin-Kits


55/YO Mum Looks 35 — Mum Reveals Shocking Trick for Erasing Wrinkles! Doctors Hate Her ... > PureaSkincare.com/AntiAging


Related Stories

 **Atlantic Heat Constrains Arctic Sea Ice Extent** (June 26, 2012) — The Arctic sea ice cover is a sensitive indicator of climate variability and change. Researchers have for the first time quantified how Atlantic heat influences the sea ice extent in the Barents Sea, ... > [read more](#)

 **Geophysicists Employ Novel Method to Identify Sources of Global Sea Level Rise** (Apr. 24, 2012) — As the Earth's climate warms, a melting ice sheet produces a distinct pattern of sea level change known as its sea level fingerprint. Now, geophysicists have found a way to identify the sea level ... > [read more](#)

 **Mountain Glacier Melt to Contribute 12 Centimeters to World Sea-Level Increases by 2100** (Jan. 11, 2011) — Melt off from small mountain glaciers and ice caps will contribute about 12 centimeters to world sea-level increases by 2100, according to new ... > [read more](#)

 **Melting Icebergs in Polar Oceans Causing Sea Level Rise Globally, New Assessment Finds** (Apr. 29, 2010) — Scientists have discovered that changes in the amount of ice floating in the polar oceans are causing sea levels to rise -- by a mere hair's breadth today, but possibly much more if melting trends ... > [read more](#)

 **Mysteriously Warm Times in Antarctica** (Nov. 22, 2009) — A new study of Antarctica's past climate reveals that temperatures during the warm periods between ice ages (interglacials) may have been higher than previously thought. The latest analysis of ice ... > [read more](#)

 **Sea Ice At Lowest Level In 800 Years Near Greenland** (July 2, 2009) — New research, which reconstructs the extent of ice in the sea between Greenland and Svalbard from the 13th century to the present indicates that there has never been so little sea ice as there is ... > [read more](#)

 **Sea Level Rise Of One Meter Within 100 Years** (Jan. 11, 2009) — New research indicates that the ocean could rise in the next 100 years to a meter higher than the current sea level -- which is

Just In:

Ancient Shark: Clues to Origin of Great White

► [more breaking science news](#)

Social Networks

Recommend ScienceDaily on **Facebook**, **Twitter**, and **Google +1**:

Like 19.2K Send 46.2K followers 43,070 people like this. Be the first of your friends.

+4215 Recommend this on Google

Other bookmarking and sharing tools:

Breaking News

... from NewsDaily.com

Scientists identify new risk gene for Alzheimer's



Military drones zero in on \$400 billion civilian market

Scientists go the whole hog in genome mapping

Russia says satellites normal after cable break

U.S. to station space radar in Australia

Scientists use genome sequencing to halt superbug outbreak

Australians treated to rare full solar eclipse

First map produced of universe 11 billion years ago

[more science news](#)

In Other News ...

China Communist Party unveils new leadership

They are hard to set in motion (slow to 'spin up'), but once they are reacting, they will be equally slow to 'spin down'. So a lag of a few centuries is worrisome, because we have been warming up the climate for 150-160 years now. If the natural relationship (when changes in climate were slower than today) also holds for the very fast changes in climate today, then we are coming into that 'window' of time where we may expect to start seeing some unprecedented responses in the large ice sheets. This then may tie in with observations of the past decade or so of large ice-shelf collapses around Antarctica and Greenland, the major melt-area expansion over Greenland, changes in the flow speed of major ice streams (both Antarctica and Greenland), and increasing ice-mass loss over West Antarctica/the Antarctic Peninsula and Greenland.

"We cannot say whether this proves the case, but at least the time delay of the modern ice-sheet responses relative to climate change would seem to agree with the response timescales we have now found in the palaeo-record."

Co-author Christopher Bronk Ramsey, from Oxford University, who helped with radiocarbon dating on the project and developed some of the age-modelling techniques used, adds: "What is new here is that our dating of the marine sediment is much more direct. This gives us far more accurate age profiles for the sedimentary sequences, which in turn provides valuable insight into the way the earth system has worked in the past."

The study, which is published in the latest issue of *Nature*, also hints that temperatures over Greenland changed virtually simultaneously with ice volume, whereas temperatures over Antarctica were leading ice-volume change by up to 700 years. Professor Rohling explains why this may be the case:

"Ice volume is related to ice area, and ice is very reflective. So a large ice volume/area reflects a lot of incoming solar radiation. When the ice volume/area reduces, less incoming radiation is reflected, which leads to regional warming. Atmospheric temperature has little inertia, so it will respond very quickly to ice-volume changes.

"Our observations suggest that the Greenland temperature changes may largely be regional responses to changes in ice volume (at that time over North America and also Eurasia). In contrast, the Antarctic relationship suggests that temperature changes as recorded in Antarctic ice cores may have been driving the ice-volume changes. Possibly, the Antarctic temperature changes reflect the fundamental underlying global temperature changes that drove the ice-volume changes, while the Greenland temperature record primarily represents a regional temperature response to the changing ice volumes. These are intriguing hints at fundamental aspects of the Earth System's response to climate change, which merit further investigation."

Share this story on [Facebook](#), [Twitter](#), and [Google](#):

Like 9 Tweet 19 2

Other social bookmarking and sharing tools:

| 4

Story Source:

The above story is reprinted from [materials](#) provided by [University of Southampton](#), via AlphaGalileo.

Note: Materials may be edited for content and length. For further information, please contact the source cited above.

Journal Reference:

1. K. M. Grant, E. J. Rohling, M. Bar-Matthews, A. Ayalon, M. Medina-Elizalde, C. Bronk Ramsey, C. Satow, A. P. Roberts. **Rapid coupling between ice volume and polar temperature over the past 150,000 years.** *Nature*, 2012; DOI: [10.1038/nature11593](https://doi.org/10.1038/nature11593)

Need to cite this story in your essay, paper, or report? Use one of the following formats:

- APA University of Southampton (2012, November 14). New dating of sea-level records reveals rapid response between ice volume and polar temperature. *ScienceDaily*. Retrieved November 15, 2012, from <http://www.sciencedaily.com/releases/2012/11/121114134058.htm>
- MLA

Note: If no author is given, the source is cited instead.

three times higher than predictions from the UN's Intergovernmental ... > [read more](#)

New Method To Estimate Sea Ice Thickness

(Mar. 7, 2008) — Scientists recently developed a new modeling approach to estimate sea ice thickness. This is the only model based entirely on historical observations. The model was developed by scientists with the ... > [read more](#)

Ads by Google

Brain Training Games — Improve memory with scientifically designed brain exercises. ... > www.lumosity.com

Sliding Head CNC Turning — High volume CNC turning Small and Intricate Turned Parts ... > www.merceng.co.uk

Not installing solar? — Give the University of Manchester your opinions in this survey: ... > ssiweb.humanities.manchester.ac.uk/

Southern Electric iplan — Free Smarter Energy kit & £75 worth of Ice points. Switch & be rewarded ... > southern-electric.co.uk/iplan_ice

Teaching Science — Get into teaching & find out about teaching science. ... > www.education.gov.uk

with Xi at the top

BP to pay record fine for 2010 spill: sources

Laptop with NASA workers' personal data is stolen

Executives urge White House, lawmakers to avoid "fiscal cliff"

U.N. Security Council calls emergency session on Israel raids

Relaxed yet feisty, Obama lays out second-term agenda

Obama rebukes Republicans over Benghazi, backs UN Ambassador Rice

Petraeus mistress had substantial classified data on computer: sources
[more top news](#)

Copyright Reuters 2008. See [Restrictions](#).

Free Subscriptions ... from ScienceDaily

Get the latest science news with our free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

[Email Newsletters](#)

[RSS Newsfeeds](#)

Feedback ... we want to hear from you!

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

Your Name:

Your Email:

Comments:

Click button to submit feedback:

[Save](#) [Email](#) [Print](#) [Share](#)

Disclaimer: Views expressed in this article do not necessarily

reflect those of ScienceDaily or its staff.

Search ScienceDaily

Number of stories in archives: 127,594

Find with keyword(s):

Enter a keyword or phrase to search ScienceDaily's archives for related news topics, the latest news stories, reference articles, science videos, images, and books.

*About ScienceDaily® | Editorial Staff | Awards & Reviews | Contribute News | Advertise With Us | Privacy Policy | Terms of Use
Copyright © 1995-2012 ScienceDaily LLC — All rights reserved — Contact: editor@sciencedaily.com
Note: This web site is not intended to provide medical advice, diagnosis or treatment.
Part of the iVillage Your Total Health Network*