

**Ocean and Climate Change Institute
2005 Funded Research
Final Report**

Assessing Rapid Climate Change During the Last Interglacial with a New Approach to Sea Level Reconstruction

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What were the primary questions you were trying to address with this research? (Or, if more appropriate, was there a hypothesis or theory that you were trying to prove or disprove?)

In the broadest terms, I want to understand the mechanisms of global climate change. For this project, I wanted to know how sea level changed during the Last Interglacial. During this time, about 120 thousand years ago, global temperatures were probably a few degrees warmer than today, quite similar to the climate we might expect by the year 2100, if current projections of global warming come to pass. Therefore, the sea level changes that occurred 120,000 years ago offer a preview of what we may experience in the next 100 years.

What have you discovered or learned that you didn't know before you started this work?

By studying fossil coral reefs in the Caribbean, I confirmed that sea levels 120 thousand years ago were at least 13 to 20 feet higher than today's sea level. Furthermore, sea levels were constantly changing over a period of 10,000 years. This suggests that in a climate slightly warmer than today's, the polar ice caps were significantly less stable than they are now.

What is the significance of your findings for others working in this field of inquiry and for the broader scientific community?

As part of this project, I am testing and refining new methods of coral dating and sea level reconstruction. This improved approach allows a much more accurate and detailed sea level history. These new methods have reinvigorated research in sea level reconstruction. The discovery that sea levels in a warmer climate were both higher and fluctuating more rapidly than today presents a challenge to those who observe and model the behavior of polar ice caps.

What is the significance of this research for society?

A large fraction of the world's population lives in coastal areas. If future global temperatures approach those of 120 thousand years ago, coastal inhabitants may have to adapt to higher and more rapidly changing sea levels.

What were the most unusual or unexpected results and opportunities in this investigation?

Although it was known that sea levels during the Last Interglacial were higher than today, the new study reveals the timing of sea level changes more accurately. The big surprise was the finding that sea level was fluctuating by at least 20 feet in cycles lasting a few thousand years. It was previously thought that sea levels during the Last Interglacial stayed about the same for more than 10,000 years.

When and where was this investigation conducted? (For instance, did you conduct new field research, or was this a new analysis of existing data?)

I collected fossil corals for dating from several Last Interglacial reefs worldwide: I spent a month on the Caribbean island of Barbados during July of 2005, visited the Bahamas islands of San Salvador and Great Inagua in the spring of 2006, and spent a month in remote northwestern Australia in the fall of 2007.

What were the key tools or instruments you used to conduct this research?

Tools for fieldwork range from the low-tech (hammers and chisels), to the high-tech (GPS mapping tools). The dating of the fossil corals is done at the Plasma mass spectrometry facility at WHOI. Corals incorporate trace amounts of uranium from seawater into their skeletons as they grow. Radioactive decay converts this uranium to thorium at a known rate, providing a 'clock' that records the corals age. The mass spectrometer counts the atoms of uranium and thorium present in the fossil coral skeleton.

Is this research part of a larger project or program?

The results from this OCCI-funded study helped to acquire funding from the National Science Foundation for further work on this topic.

What are your next steps?

Using these newly-tested techniques, I hope to expand my studies to earlier interglacials from the last 600,000 years. This work will help us to better understand the relationship between global temperature and sea level, and provide a guide to future sea level rise as the planet continues to warm.

Have you published findings or web pages related to this research? Please provide a citation, reprint, and web link (when available).

None yet.

Please provide photographs, illustrations, tables/charts, and web links that can help illustrate your research.

Photos attached!

Photo Captions:



Photo 1: Examining an outcrop of the fossil coral reef on Great Inagua Island, Bahamas. From left to right: Bill Thompson (WHOI), Mark Wilson (Wooster College of Ohio), Annie Steward and Emily Griffin (undergraduate students, Wooster College of Ohio). (photo: Al Curran, Smith College)



Photo 2: Sampling the Last Interglacial fossil coral reef near Exmouth, Western Australia. (Photo: Bill Thompson)