

## NEWS

## Sea-level rise higher than expected

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**Current carbon dioxide (CO<sub>2</sub>) levels in the atmosphere may commit us to sea-level rises of up to 25 metres, says new research based on a comparison of Antarctic ice temperature records with new sea-level data from the Red Sea.**

The findings predict a sea-level rise much higher than the seven metres estimated by previous models and the Intergovernmental Panel on Climate Change (IPCC).

The changes in temperature and atmospheric CO<sub>2</sub> are well documented for the past hundreds of thousands of years. The same cannot be said about sea-level changes. 'Not much is known about long-term sea-level changes in response to global warming,' says Professor Eelco Rohling, from the National Oceanography Centre, Southampton.



In a new report published today in *Nature Geoscience*, Rohling presents a new detailed record of 520,000 years of sea-level change, based on data collected from the bottom of the Red Sea.

'These real measurements from past times can be used as reality-checks for models, and this will help improve the quality of predictions for the future.'

**Professor Eelco Rohling,  
National Oceanography  
Centre, Southampton**

The team analysed around 2000 foraminifer shells. Foraminifers are tiny organisms that have lived in the oceans for millions of years. By studying changes in the oxygen chemistry of the shells, the scientists can tell how sea level has in the Red Sea for the past 520,000 years.

The Red Sea is perfect for this kind of study because it has 'a very simple water cycle, with no major rivers running to it and only a narrow connection to the Indian Ocean,' explains Rohling.

The new record of sea-level changes matches Antarctic ice temperatures almost point by point - when the temperature goes up, the sea levels rise, when the

climate cools down, ice caps expand and the oceans recede.

Because the link between temperatures and sea level has been clear in the past, differences in temperature can be used to predict future sea-level changes. 'We can assume that our observed natural relationship between CO<sub>2</sub> and temperature, and sea level, offers a reasonable model for a future with sustained global warming,' says Rohling.

### So what does the past tell us about the future?

The direct relationship between CO<sub>2</sub> levels and global warming estimates a rise of up to 16°C in Antarctic temperatures over thousands of years for the current levels of CO<sub>2</sub> in the atmosphere.

Rohling fed this data into his predictions for how sea level will change and found that the sea may rise a staggering 25 metres over thousands of years in response to this warming.

This value is much higher than the IPCC worst predictions of a rise of seven metres. 'Even if our 25 metres estimation is not absolutely correct, our findings suggest that the IPCC prediction is underestimated,' says Rohling.

The estimate of 25 metres sounds high, but it is in good agreement with independent data calculated for the Middle Pliocene. Back then, 3 million years ago, when CO<sub>2</sub> levels in the atmosphere were similar to the ones we have today, the sea level was between 15 and 25 metres higher than it is now.

'These results show how important it is to develop not only models for the future, but to match that with developing detailed data for the past. These real measurements from past times can be used as reality-checks for models, and this will help improve the quality of predictions for the future,' says Rohling.

E. J. Rohling, K. Grant, M. Bolshaw, A. P. Roberts, M. Siddall, Ch. Hemleben and M. Kucera. Antarctic temperature and global sea level closely coupled over the past five glacial cycles. *Nature Geosciences*, published online 21 June 2009.

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