Mussel power: Ocean shells can help predict rise in sea levels

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Ocean mussels could be key to helping scientists predict more accurately the rise in sea levels caused by the melting of the Greenland Ice Sheet.

A University of Reading study has shown that mussel shells accurately record the amount of meltwater running off the ice sheet during the summer. The researchers believe analysing shells hundreds to thousands of years old will reveal how much Greenland meltwater, caused by the natural climate variability of the Earth, contributed to previous sea level fluctuations.

This information can then be fed into climate models allowing scientists to better predict the behaviour of the Ice Sheet during future variations in climate. Crucially this will also tell us how much melting is due to human influence.

Due to global warming the sheet melted at an unprecedented rate during 2012 with the thawed ice area jumping from 40% to 97% in just four days during July. Melting is predicted to raise global sea levels during the 21st century by up to 10 cm and if the sheet was to completely melt, which would take centuries, sea levels would rise by about seven metres. This could threaten low-lying countries like the Netherlands and less developed countries such as Bangladesh.

Dr Emma Versteegh, from the University of Reading's Department of Geography and Environmental Sciences, who conducted the research with co-workers from Greenland and Denmark, said: "The Earth's climate naturally varies over long timescales and there have been warm intervals before during which the amount the Greenland Ice Sheet melted might have varied considerably. Examples include the Holocene Climatic Optimum (roughly 9000 to 5000 years BC) and the Medieval Warm Period (~ AD 950 to 1250).

"Very little is known about the dynamics of Greenland Ice Sheet melting. In order to understand its behaviour and predict future melting, information on meltwater amounts during different climatic regimes is hugely important. However instrumental data only cover the last few decades, so other methods are needed to look further into the past."

Using blue mussels found in different areas off the coast of West Greenland, Dr Versteegh found that the shells revealed the amount of meltwater running off the ice sheet during the summer. Mussels and other shells have been used before to reconstruct past climate, but this is the first time they have been used to indicate past meltwater amounts.

Dr Versteegh continued: "Over several years we collected shells at different locations in Godthåbsfjord and also measured water composition and temperature. Meltwater is characterised by a very different oxygen isotopes composition than seawater. By analysing these isotopes in the mussels' annual growth bands we will be able to reconstruct the melting of the Greenland Ice Sheet during several warm periods over the past 10,000 years. This will give climate scientists vital information on how the Earth's natural variations in climate affect the Ice Sheet, and in turn sea levels, which they can use to further improve predictions of sea level rises stemming from climate change."

"Oxygen isotope ratios in the shell of Mytilus edulis: archives of glacier meltwater in Greenland" is published on the *Biogeosciences* websites www.biogeosciences.net/

Provided by University of Reading