Catastrophic 'lake burst' chills climate

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Ocean circulation changes during the present warm interglacial were more extensive than previously thought, according to new research by the University of East Anglia (UEA) and Cardiff University.

The findings, reported in this week's edition of the international journal *Science* (30 June 2006), prove for the first time that sudden North American 'lake bursts' slowed ocean circulation and cooled the climate approximately 8200 years ago. The groundbreaking research increases our understanding of the complex link between ocean circulation and climate change and highlights the sensitivity of the Atlantic overturning circulation to freshwater forcing.

Christopher Ellison and Dr Mark Chapman, of UEA's School of Environmental Sciences, and Dr Ian Hall, of Cardiff University's School of Earth, Ocean and Planetary Sciences, investigated whether there was a connection between the catastrophic freshwater release from glacial lakes in North America, ocean circulation changes and the dramatic cooling seen in many climate records approximately 8200 years ago. The research team studied a sediment core taken from the seabed of the North Atlantic.

"The core contains sediments representing the warm interval since the last Ice Age," said Christopher Ellison of the University of East Anglia. "The sediment includes a variety of small animals called foraminifera that record surface water conditions in their shells when living. We analysed changes in the abundance of different species of foraminifera and the chemistry of the shells to examine past patterns of climate

change. We also analysed the sediment grain size to gauge the speed of deep ocean currents and therefore the strength of ocean circulation."

The new findings provide direct evidence of both the freshwater forcing and the climate response.

"The 8200-year-old event is the most recent abrupt climate change event and by far the most extreme cooling episode in the last 10,000 years, but up until now we knew comparatively little about its impact, if any, on the ocean circulation," said Dr Mark Chapman of the University of East Anglia. "Our records show a sequenced pattern of freshening and cooling of the North Atlantic sea surface and an associated change in the deep ocean circulation, all key factors that are involved in controlling the state of northern hemisphere climate."

Dr Ian Hall of Cardiff University said: "The impact of large-scale pulsed inputs of freshwater on ocean circulation and climate during the time of the last Ice Age are well documented, but our results clearly demonstrate that these sorts of abrupt reorganisations also can occur during periods of warm climate. These findings have important implications for future research because they aid our understanding of the magnitude of forcing involved in rapid climate changes and the mechanisms involved. This provides a useful target for assessing the models that are used to predict future patterns of climate change".

The study was supported by the Natural Environment Research Council and is part of a national programme, RAPID, aimed at improving scientist's ability to quantify the probability and magnitude of future rapid change in climate.

Source: University of East Anglia