Shedding light on ice sheet collapse through Great Barrier Reef

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An international team of scientists jointly led by Dr. Jody Webster, of the University of Sydney, and Dr Yusuke Yokoyama, of the University of Tokyo, is analyzing sediment cores drilled by the research ship, the Greatship Maya, across the Great Barrier Reef last year.

The scientists are using the reef as a record of sea level fluctuations and climate change from the peak of the last Ice Age, about 21,000 years ago, to the first two millennia of the current warm Holocene epoch, which started about 12,000 years ago.

Coral reefs are markers of sea level. Coral gets its energy from photosynthetic algae in a symbiotic relationship with it. When the sea level gets too high, less sunlight is captured by the algae, and the reef dies. Dead reefs form systems of terraces, ridges and pinnacles, the dates of which reveal sea level changes.

Scientists want to pin down the timing and impact of abrupt sea level rise when ice sheets melted in the past, in order to make predictions about the greenhouse future. The behaviour of the ice sheets is among the big unknowns of climate science. If the West Antarctic ice sheet melted, the impact would be catastrophic, leading to a five to six metre sea level rise and changes to seawater salinity that could send ocean circulation awry.

The team took cores of extinct coral reef and sediment from 34 holes drilled during an expedition to the Great Barrier Reef mounted by the Integrated Ocean Drilling Program, a multi-million-dollar international

research effort to explore the ocean floor.

The cores were obtained along transects from the outer reaches of the continental shelf beyond the base of the Great Barrier Reef, which started to assume its modern configuration up to 8000 years ago.

The Australian team members, also including scientists at the Australian National University and the University of Wollongong, are dating the relict reefs using the radiocarbon and uranium-thorium techniques on the calcium carbonate coral exoskeletons. Geochemists are using the fossil corals in the cores to work out past oceanographic conditions such as sea surface temperature and ocean salinity at key turning points in the reef's history.

Dr. Webster said the scientists were focusing on three periods of "meltwater pulses", one of which is thought to have happened about 14,000 to 15,000 years ago, when the sea level rose up to 20 metres within a few hundred years.

"We're trying to get a better handle on the dynamics of ice sheet behaviour and global sea level changes," he said.

"The information will be used by sea level and ice sheet modellers to better understand how the ice sheets have collapsed in the past and hopefully improve future predictions."

Meanwhile, Dr. Webster told the meeting of the American Geophysical Union in San Francisco in December that the team had pinpointed the remnants of the coral reef that was growing at the height of the last Ice Age.

"There has been a lot of debate over where the Great Barrier Reef goes during times of lower sea level during ice ages," he said.

Provided by University of Sydney