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Climate and Sea-level changes since the last glacial maximum: Preliminary results from IODP Expedition 325 the Great Bar

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Sea-level was lower by as much as 120 m and climate was colder globally during the last glacial maximum (LGM) at around 20 ka. Because the environmental changes since the LGM comprise the largest magnitude changes during the Earth's recent history, data of this period recorded in geological archives are important for understanding climate dynamics and ecological responses. The history of environmental changes are best recorded in fossil coral reefs from the LGM, and hence Integrated Ocean Drilling Program (IODP) Exp. 325 was designed to recover samples of these fossil reefs on the shelf edge of the Great Barrier Reef (GBR). Three major objectives of Expedition 325 are to 1) establish the course of sea level change, 2) define sea-surface temperature variations, and 3) analyze the impact of these environmental changes on reef growth and geometry for the region over the period of 20 ? 10 ka. This expedition compliments Exp. 310 "Tahiti Sea Level" that in 2005 recovered Postglacial coral reef cores around Tahiti between 41.6-117.5 meters below sea level that span ˜ 16 to ca. 8 ka.

The offshore phase of Exp. 325 was conducted from February to April 2010 to core a series of fossil reef preserved along the shelf edge of the Great Barrier Reef at three geographic locations (Hydrographers Passage, Noggin Pass and Ribbon Reef). A total of 34 boreholes across 17 sites were drilled in four depth transects ranging from 42.2 to 167.2 meters below sea level. Wireline logging operations at four boreholes provided continuous geophysical information about the drilled strata. According to the Onshore Science Party at the IODP Bremen Core Repository (Germany) in July 2010, high-quality fossil coralgal frameworks are found in a number of horizons of different cores thus recording high energy reef settings, which crucial for precise reconstructions of sea level and sea-surface environmental change. Ages obtained so far range from $>$ 30 to 9 ka, indicating successful capture of the period of interest. This includes the time into and out of the LGM, the 19ka-Mwp, Mwp-1a, t
he Younger Dryas, the Bolling-Allerod, and Heinrich Events 1 and 2. The fact that there are very limited number of fossil coral records spanning these intervals, and even fewer from tectonically stable, passive margin settings far from the confounding influence of ice sheets, only highlights further the importance of the new Exp. 325 cores.

We will summarize Exp. 325's preliminary results and their broader implications for understanding global sea level and paleoclimate changes, as well as how coral reefs respond to environmental stress.

Keywords: Great Barrier Reef, Coral reef, sea level, paleoclimatology, paleoceanography, IODP