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## Scientists discover new evidence of changes in climate and sea levels

**November 17, 1990 COLLEGE STATION, TX** -- After recovering sediment from beneath the Great Barrier Reef, oceanographers are rewriting the reef's geologic history and interpreting new evidence of changes in the global environment.

The scientists, part of the internationally funded Ocean Drilling program, recovered more than three miles (5,500 meters) of sediment, a record for the six-year-old program. The sediment record shows a young reef that has responded to at least 24 cycles of global sea-level change during the last 1 million years or less.

The Great Barrier Reef, the largest structure on Earth built by living creatures, stretches more than 1200 miles (2000 km) along the northeast coast of Australia. At 80,000 square miles (more than 200,000 square kilometers), the reef's size approximates the size and shape of the state of Utah.

Despite its immense proportions, scientists for the Ocean Drilling Program discovered that the reef is a mere infant in geological time. They now pinpoint its age at only 500,000 to 1 million years old, considerably younger than the 20 million years previously assigned to the structure.

Skeletons and skeletal debris of tiny marine organisms built the reef over thousands of years. The 24 cycles of death and rebirth observed in the reef reflect the changes in global sea levels that have occurred in recent geologic time. Rising or falling sea level, for instance, can lead to the reef's demise through drowning or exposure.

Scientists link low sea levels to ice ages when polar ice caps advance, while high sea levels correspond to warmer periods in Earth's history when polar ice retreats.

### Greenhouse v. icebox

Scientists consider today's sea level to be relatively high compared to earlier geologic times. A current issue among environmentalists, scientists and policy makers concerns the direction of future changes in the sea level. Opinion is divided: considering the current geologic record, sea level appears overdue to fall, implying that shorelines around the world would recede as global temperatures drop. Based on past patterns, Earth should, therefore, be entering into an "ice box" environment. Adherents of the "greenhouse theory" argue, however, that human activity has tampered with Earth's atmosphere, causing worldwide increases in temperature that may result in rises in sea level.

By documenting the patterns of change in sea level and the effect on living structures like coral reefs, scientists can gain a better understanding of what has occurred in the past. The message from this cruise, the scientists say, is that Earth is a huge feedback system with a history of constant change. How well we read its response to past environmental changes will govern how we assess current human activity and its effect on global environment.

Co-chief scientists for the cruise were Dr. Peter J. Davies, Bureau of Mineral Resources, Canberra, Australia, and Dr. Judith A. McKenzie, Geological Institute, ETH, Zurich Switzerland. Dr. Amanda Palmer Julson of Texas A&M University, College Station, was the staff scientist.

The ship *JOIDES Resolution* left Guam August 9 and arrived in Townsville, Australia, October 11. Thirty scientists from the United States, Australia, Canada, Federal Republic of Germany, France, Japan, Spain, Switzerland, Taiwan and the United Kingdom participated on the cruise.

*JOIDES Resolution*, registered as Sedco/BP 471, is the research vessel for the ODP, which is funded by the United States National Science Foundation, the Canada/Australia Consortium for the ODP, the European Science Foundation Consortium for the ODP, the Federal Republic of Germany, France, Japan and the United Kingdom.

The 470-foot-long drill ship's derrick towers 200 feet above the

waterline. A seven-story laboratory stack provides facilities for on board examination of sediment and hard-rock cores. Laboratories contain space and equipment for studies in chemical, gas and physical properties, paleontology, petrology, paleomagnetics and sedimentology. Marine geophysics research is conducted while the ship is under way.

Texas A&M University, as science operator, operates and staffs the drill ship and retrieves cores from strategic sites around the world. The science operator also ensures that adequate scientific analyses are performed on the cores. To do this, Texas A&M maintains shipboard scientific labs and provides logistical and technical support for shipboard scientific teams. On shore, the science operator manages post-cruise activities, curates the cores and publishes the scientific results.

Lamont-Doherty Geological Observatory of Columbia University is responsible for downhole logging.

Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), an international group of scientists, provides scientific planning and program advice. Joint Oceanographic Institutions (JOI, Inc.), a nonprofit consortium of 10 major U.S. oceanographic institutions, manages the program.

At the end of 1990, the ship will make its way to the East Pacific, said Dr. Philip D. Rabinowitz, director of the ODP.

"Before drilling off the coasts of the Americas, we'll drill off the Pacific islands of Vanuatu and Hawaii," he said.

Note: JOIDES Institutions are: University of California at San Diego; Columbia University; University of Hawaii; University of Miami; Oregon State University; University of Rhode Island; Texas A&M University; University of Texas at Austin; University of Washington; and Woods Hole Oceanographic Institution.

Non-U.S. members are Canada and Australia Consortium for the ODP, European Science Foundation Consortium for the ODP (Belgium, Denmark, Finland, Iceland, Italy, Greece, the Netherlands, Norway, Spain, Sweden, Switzerland and Turkey); Federal Republic of Germany; France; Japan; and the United Kingdom.

Scientists participating on the cruise were: Peter J. Davies, co-chief scientist, Bureau of Mineral Resources, Geology and Geophysics, Canberra, Australia; Judith A. McKenzie co-chief scientist, Geologisches Institut, Zurich, Switzerland; Amanda A. Palmer Julson, ODP staff scientist, Texas A&M University, College Station, Texas; Christian Betzler, Goethe Universitat, Frankfurt, Federal Republic of Germany; Thomas C. Bracher, Institut fur Palaontologie, Erlangen, Federal Republic of Germany; Min-Pen Philip Chen, National Taiwan University, Taipei, Taiwan, Republic of China; Jean-Pierre Crumiere, Universite Claude Bernard, Villeurbanne, France; George R. Dix, University of British Columbia, Vancouver, British Columbia, Canada; Andre W. Droxler, Rice University, Houston, Texas; David A. Feary Bureau of Mineral Resouces, Geology and Geophysics, Canberra, Australia; Stefan Gartner, Texas A&M University, College Station; Craig R. Glenn, University of Hawaii; Honolulu; Alexandra Isern, University of Rhode Island, Narragansett; Peter D. Jackson, British Geological Survey, Nottingham, United Kingdom; Richard D. Jarrard, Lamont-Doherty Geological Observatory, Columbia University, Palisades, N.Y.; Miriam E. Katz, Lamont-Doherty Geological Observatory; Kenji Konishi, Kanazawa University, Ishikawa, Japan; Dick Kroon, University of Edinburgh, Scotland, United Kingdom; John W. Ladd, Ocean Drilling Program, National Science Foundation, Washington, D.C.; Jose Manuel Martin, Universidad Granada, Spain; Donald F. McNeill, University of Miami, Fla.; Lucien F. Montaggioni, Universite de Provence, Marseille, France; Daniel W. Muller, Geologisches Institut, Zurich, Switzerland; Sheraz Khan Omarzai, University of California, Santa Cruz.; Chris J. Pigram, Australian National University, Canberra, Australia; Peter K. Swart, University of Miami; Philip A. Symonds, Bureau of Mineral Resources, Geology and Geophysics, Canberra, Australia; Keith F. Watts, University of Alaska, Fairbanks; Wuchang Wei, Florida State University, Tallahassee.