

Leg 207

Ocean Drilling Program Recovers Evidence of Past Rapid Global Climate and Ocean Circulation Changes

March 6, 2003 A team of scientists from nine nations arrived in Rio de Janeiro today after finishing Leg 207, a two-month Ocean Drilling Program expedition in the equatorial Atlantic Ocean off the coast of Surinam. During this research cruise, they collected sediments from an area known as the Demerara Rise to study periods in the Earth's history that have undergone rapid climate and ocean circulation changes, often leading to periods of plant and animal mass extinctions.

Co-chief scientist on the cruise, Jochen Erbacher (Federal Institute for Geosciences and Natural Resources, Germany), explained the science behind the cruise: "One site on the Demerara Rise was drilled in 1970 by the Deep Sea Drilling Project (the precursor to the Ocean Drilling Program). Although recovery was not continuous, they found sediments from the Cretaceous Period (140-65 million year ago) that contained evidence of periods when the equatorial Atlantic Ocean was without oxygen. These periods, known as Ocean Anoxic Events (OAE), required the oceans to have a significantly different circulation pattern than today, and therefore, climate would have been significantly different. We don't yet fully understand the reasons for these differences. Our objective was to re-core the former DSDP site to attempt 100% recovery and to core four other sites from varying water depths to understand past ocean circulation with respect to water depth change."

The team also cored other periods of dramatic change in the Earth's history. Well-preserved intervals of the Cretaceous/Tertiary boundary were recovered. This is the point in time, about 65 million years ago, when a meteorite impacted with the Earth and forced the extinction of many plants and animals, including the dinosaurs. A distinctive bed of fallout material from the explosion was found at each drill site, coincident with a major change in microfossil species within the sediments.

Another interval of major change was the Paleocene/Eocene boundary, about 55 million years ago, when the Earth suddenly warmed significantly. It is believed that gradual warming led to geologically sudden dissociation of gas hydrates stored in marine sediments. This dissociation led to release of methane gas into the atmosphere. This greenhouse gas amplified global warming, leading to a major change in ocean productivity and the extinction of many ocean microorganisms.

Recovery of these "critical intervals" was not the only success of the expedition. As co-chief scientist David Mosher (Geological Survey of Canada) explains, "With excellent core recovery in combination with measurement of Earth properties with downhole logging techniques, we can study cycles of change that have occurred throughout the Earth's history. These changes appear to be related to astronomical forces, such as variations in the Earth's rotation about the sun and wobble in the Earth's axis. These techniques also allow us to fit results of this Demerara Rise study into a global context."

Included in the team of scientists were sedimentologists, stratigraphers, paleontologists, geochemists, engineers, and geophysicists. "It is only through the integration of all these disciplines that we can begin to understand the causes and effects of these periods of climatic and oceanographic change. With a better understanding of what happened in the past, we can perhaps know more about what the Earth is presently enduring," said Dr. Mosher.

ODP is an international partnership of scientists and research institutions organized to study the evolution and structure of the Earth. It is funded principally by the US National Science Foundation, with substantial contributions from its international partners. The Joint Oceanographic Institutions manages the program. Texas A & M University is responsible for science operations, and Lamont-Doherty Earth Observatory of Columbia University is responsible for logging services.

Photographs from Leg 207 are available on the web at <http://www-odp.tamu.edu/public/life/leg207.html>.

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