OCEAN ◆ DRILLING ◆ PROGRAM

News Release

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FOR IMMEDIATE RELEASE

Scientists test controversial theory involving sea-level change and the production of petroleum reservoirs near the Great Bahama Bank

College Station, Tx -- Many scientists questioned the oil industry's proposal 20 years ago that sea-level changes are the architects of the Earth's continental margins, resulting in petroleum reservoirs. This theory led to the creation of the Sequence Stratigraphic Concept stating that each global sea-level change creates a characteristic package of sediments possibly found in all of Earth's sedimentary basins. With this information, geologists could predict the best location of reservoir rocks.

The Ocean Drilling Program convened scientists from eight countries aboard the world's largest scientific drill ship, *JOIDES Resolution*, in the Bahamas to specifically address this unproven theory. During ODP Leg 166, seven holes were drilled along a transect of the margin of Great Bahama Bank to extract 25 million years of sea-level changes and help resolve the controversy surrounding the Sequence Stratigraphic Concept. Core samples from these holes now confirm for the first time that global sea-level changes control the architecture of the sedimentary deposits, validating the theory.

The shallow-water Bahamas platform is a flat-topped edifice in the middle of the ocean. Sea-level regulates the platforms growth because reefs and algae that secrete the building material (carbonate sediments) are only active when the platform is flooded. When sea-level rises, carbonate sediment is exported into the deeper water areas to form thick sedimentary packages on the Bahamian slopes. In contrast, during sea-level falls, the platform is exposed to form a large karstified island and sediment production ceases.

The research team found 17 depositional units that together build a sedimentary pile that is over 1,300 meters thick. The composition of the sediments show that each one of these seventeen packages is separated by a time of reduced sedimentation when the platform was exposed and, therefore, are records of past sea-level changes. ODP scientists were able to precisely determine the ages of these units by microfossils. The recorded ages correlate with the interpreted ages of the large sea-level fluctuations of the last 25 million years derived from the Sequence Stratigraphic model.

Thus, on the slopes of Great Bahama Bank the history of sea-level changes has been encoded in the sedimentary record. In addition, such carbonate deposits are important reservoirs for hydrocarbons and freshwater. For example, 60 percent of the known hydrocarbon reservoirs in the continental U.S. are in carbonate rocks. However, the processes that produce porous reservoir rocks from these muddy sediments are not well understood. Scientific research in the Bahamas, where the processes of transforming sediments into rocks are active today, provide the key to understanding how a reservoir rock is created.

ODP scientists also discovered large thicknesses of organic-rich carbonate sediments deposited on the margin of the platform. The combination of the degradation of this hydrocarbon material together with the circulation of seawater through the sediments, documented for the first time during Leg 166 drilling, allows the chemical conditions to change in the pore waters causing dissolution of the original minerals and the precipitation of new ones. This process changes the rock from a relatively impermeable soft sediment into a rigid structure. Scientists also found evidence of the production of oil and gas in older times. These compounds were probably produced deep within the platform and migrated upwards where they were oxidized by sulfate-reducing bacteria producing corrosive fluids. These fluids further add to the potential for dissolving and cementing the sediments to create new reservoir rocks. As a result of the demonstrated circulation in the upper slope of the platform, these reactions involving the organic material can potentially influence large portions of the entire bank, providing the ideal conditions for a giant petroleum reservoir rock. Given another 20 million years, the Bahamian margin may become another Middle East oil field.

The Ocean Drilling Program is funded by the U.S. National Science Foundation, Canada, Australia, the European Science Foundation Consortium, Germany, France, Japan, and the United Kingdom to investigate such topics as earth's history and evolution, climate change, and formation of the ocean crust.

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

Texas A&M University, science operator, operates and staffs the drill ship that retrieves core samples from strategic sites in the world's oceans. Lamont-Doherty Earth Observatory of Columbia University is responsible for downhole logging.

Note: U.S. members of JOIDES 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. The European Science Foundation Consortium consists of Belgium, Denmark, Finland, Iceland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, and Turkey.

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