



Ocean Drilling Expedition Retrieves “Greatest Hits of Paleoclimate” from the North Atlantic

Highlights Captured in Documentary Video to Debut at 2012 AGU Fall Meeting

Researchers on board the scientific ocean drilling vessel *JOIDES Resolution* recently completed an expedition to the North Atlantic, near the coast of Newfoundland, Canada. Here, near the final resting place of the ill-fated *RMS Titanic*, large sediment drifts contain detailed records of the Paleogene – a span of about 40 million years when Earth’s climate shifted from a sultry “hothouse” to a cooler climate, featuring the first polar ice sheets. The expedition succeeded in retrieving sediment cores and data from several famous events, including the Paleocene-Eocene Thermal Maximum (PETM), the Cretaceous/Paleogene (K/Pg) boundary, and the Eocene-Oligocene boundary.

A series of short online videos – shot, edited and produced on board the ship by Dan Brinkhuis of ScienceMedia.NL – detail the science goals and technical challenges of the expedition. (<http://bit.ly/UcMNPT>) Additionally, a new 20-minute documentary on the expedition will make its debut at the 2012 American Geophysical Union (AGU) Fall Meeting, December 3-7, in San Francisco. The documentary will be part of the “AGU Cinema” session, held for the duration of the meeting in Moscone West, Room 2012. It will also be screened continuously at the Consortium for Ocean Leadership booth (#1117) in the Exhibit Hall.

The time intervals and events captured by the expedition, known formally as Integrated Ocean Drilling Program (IODP) Expedition 342 (Paleogene Newfoundland Sediment Drifts), constitute a “greatest hits” of paleoclimate. The findings have the potential to inform scientists about the implications of modern, human-induced climate change.

“A principal goal of the expedition was to study potential past analogs to future global change,” says Expedition Co-Chief Richard Norris of the Scripps Institution of Oceanography.

“We can measure the amount of carbon dioxide in the atmosphere today, and we can measure the amount of carbon dioxide in the atmosphere in the past. The trillion dollar question is: what is climate sensitivity?” says Expedition Co-Chief Paul Wilson of the University of Southampton, UK. “What we mean by climate sensitivity is, for a given carbon dioxide forcing, how much will global temperatures respond? And that is the question we are seeking to address with our expedition.”

The PETM, which hit a peak about 56 million years ago, is notable for extraordinarily high average temperatures – warm enough to have kept nearby Greenland completely free of ice. The K/Pg boundary, about 65 million years ago, is marked by evidence of the asteroid impact that killed the dinosaurs.

The Eocene-Oligocene boundary, about 33 million years ago, marks the division between the “greenhouse” conditions of the late Eocene and the “icehouse” conditions of the Oligocene. The transition was unusually rapid in geologic terms, taking only a few hundred thousand years. The cause of the sudden and dramatic cooling remains uncertain, but appears to have involved a ‘tipping-point’ response to a very slow decrease in greenhouse gases coupled with a shift in Earth’s orbit. Together, the changes favored cool summers and triggered rapid ice growth on Antarctica.

“What happened next in the northern hemisphere,” explains Wilson, “is something for us to find out from our drill cores.”

“This is a site that will go down truly in history, I think,” says Norris. “Because we have, by far and away, the most detailed record of this sort of transition into a fully glaciated world, that exists anywhere on the globe, right here.”

The team also retrieved cores from a very large drift of Oligocene-Miocene sediments, deposited from 23 to 5 million years ago – much of which contains spectacularly well-preserved carbonate fossils. Because of its size and conspicuous olive hue, the team nicknamed this sediment drift “The Green Monster.”

The ship later drilled sediments from the Cretaceous Period, deposited some 90 to 100 million years ago. These sediments contained evidence of a number of global Ocean Anoxic Events (OAEs) when the world's oceans became almost totally depleted of oxygen at the sea floor. These events are linked to changing ocean currents, increases in atmospheric greenhouse gases and a warming climate. OAEs appear in the geologic record as a thick layer of black carbon-rich shale.

"It's a brilliant way for the earth's system to get rid of excess carbon dioxide in the atmosphere, by burying carbon as organic matter in the ocean floor," explains Expedition Sedimentologist Bradley Opdyke of the Australian National University. "The Earth will handle this carbon dioxide we're putting into the system. The question is whether our civilization will be able to handle it."

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About IODP

The Integrated Ocean Drilling Program (IODP) is an international research program dedicated to advancing scientific understanding of the Earth through drilling, coring, and monitoring the seafloor. The *JOIDES Resolution* is a scientific research vessel managed by the U.S. Implementing Organization of IODP (USIO). Together, Texas A&M University, Lamont-Doherty Earth Observatory of Columbia University, and the Consortium for Ocean Leadership comprise the USIO. IODP is supported by two lead agencies: the U.S. National Science Foundation (NSF) and Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT). Additional program support comes from the European Consortium for Ocean Research Drilling (ECORD), the Australia-New Zealand IODP Consortium (ANZIC), India's Ministry of Earth Sciences, the People's Republic of China (Ministry of Science and Technology), and the Korea Institute of Geoscience and Mineral Resources and Coordination for Improvement of Higher Education Personnel (CAPES) in Brazil. For more information, visit www.iodp.org.

For more information about IODP Expedition 342 (Paleogene Newfoundland Sediment Drifts), visit http://iodp.tamu.edu/scienceops/expeditions/newfoundland_sediment_drifts.html

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Media Contacts:

Matthew Wright
Consortium for Ocean Leadership
Washington, D.C. USA
mwright@oceanleadership.org
+1-202-448-1254

Miyuki Otomo
IODP Management International
Tokyo, Japan
motomo@iodp.org
+81-3-6701-3188



Kerry Swain (Logging Engineer, Schlumberger Offshore Services) oversees removal of a portion of the Kinley Cutter from the logging wire line. (Credit: John Beck, IODP/TAMU)



From back to front, Bong Gobalane (Floorman, Siem Offshore), Brad Weymer (Curatorial Specialist, IODP-USIO/TAMU) and Erik Moortgat (Chemistry Laboratory Technician, IODP-USIO/TAMU) patiently wait for core to be pumped out of a stuck liner.