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**MASSIVE VOLCANISM IN THE INDIAN OCEAN  
Kerguelen Plateau offers clues to Earth's internal dynamics  
and environmental effects of volcanism**

In the remote southern Indian Ocean, straddling the Antarctic Polar Front, lies a mostly submarine plateau one-third the size of the contiguous United States. The Kerguelen Plateau is one example of a unique type of Earth feature, a large igneous province (LIP). LIPs may be the expression of the largest volcanic events in earth's history. One of the least understood features in the ocean basins, LIPs preserve a record of mantle dynamics and may have also affected the Earth's environment in the past by potentially altering ocean circulation, climate conditions and sea level.

The Ocean Drilling Program (ODP) is sending a team of 28 scientists representing eight countries to study one LIP that was initially formed from the Kerguelen Plateau and its now separate, conjugate feature, Broken Ridge. Dr. Mike Coffin of The University of Texas Institute for Geophysics and Professor Fred Frey of the Massachusetts Institute of Technology will lead the scientific team. These scientists seek to resolve their questions about the Kerguelen Plateau's eruption history by analyzing samples of sediment and lava collected from deep beneath the seafloor. Since its formation the plateau has subsided to great water depths (1 to 2.5 km).

Earth has experienced massive volcanic episodes with magma emanating from the deep mantle many times. Such episodes were relatively common between 150 and 50 million years ago, but have been infrequent during the past 50 million years. Due to their inaccessibility beneath the oceans, few large igneous provinces have been sampled and dated for comparison with similar flood basalt provinces on land.

The earliest known volcanism associated with the Kerguelen hot spot began roughly 130 million years ago when Africa, Antarctica, Australia, India, and Madagascar were just beginning to break apart, thus creating the Indian Ocean. Changing tectonic plate motions over the ensuing eons left a continuous record of the hot spot's magmatic output, with peak volcanic events creating much of the Kerguelen Plateau and Broken Ridge. The Kerguelen hot spot continues to erupt today at Heard and McDonald islands, albeit at rates much lower than those of more than 80 million years ago.

"When results of the expedition are combined with previous seafloor drilling studies of the genetically related Ninetyeast Ridge (which formed 82-38 million years ago; DSDP Legs 22 and 26 and ODP Leg 121) and ongoing studies of the younger Kerguelen and Heard Islands by French, Belgian, U.S., and Australian scientists," explains Frey, "the approximately 130 million year history of the Kerguelen hot spot will be the best understood long-term record of terrestrial hot spot volcanism."

To investigate the history of the Kerguelen Plateau and Broken Ridge, the scientific team will retrieve core samples from as deep as 1 km below the seafloor, using advanced drilling

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technology aboard the JOIDES Resolution, the world's largest and most sophisticated scientific drill ship.

Subsequent analysis of the core materials, both aboard the ship and in land-based laboratories, will enable scientists to reconstruct the magmatic history of this region, including both the timing of eruptions and changes in the chemical composition of the lavas. Scientists will continue to study whether discrete pulses of volcanism formed the Kerguelen Plateau and Broken Ridge, or if magmatism was relatively continuous during their formation. The scientists also want to know what parts of the Kerguelen Plateau include portions of continental crust, which would imply a relatively complex breakup history between India and Antarctica during the age of the dinosaurs.

"Earthquake seismology allows snapshots to be taken of the structure of the deep Earth using techniques similar to those used by doctors to image the human body beneath its skin," states Coffin, "but large igneous provinces provide the only known record of ancient deep Earth dynamics. Kerguelen Plateau and Broken Ridge hold the history of one of the largest and longest-lived magmatic events known on Earth, and the results of our expedition will undoubtedly contribute greatly to our understanding of how mantle hot spots behave through time, and their possible effects on the global environment."

The JOIDES Resolution is scheduled to depart Fremantle, Australia on 12 Dec. and conclude the expedition on 11 Feb. 1999. Australia is home to the Australian Geological Survey Organisation (AGSO). AGSO and French scientists have provided all of the site survey data for this expedition, thus enabling scientists to pin-point the spots to be drilled with no chance of hitting pockets of oil or gas.

The Ocean Drilling Program, an international partnership of scientific institutions and governments, explores the history and evolution of Earth's crust. The Ocean Drilling Program is funded principally by the National Science Foundation, with substantial contributions from its international partners. These include the Federal Republic of Germany, France, Japan, the United Kingdom, the Australia/ Canada/ Chinese Taipei/ Korea Consortium for Ocean Drilling, the European Science Foundation Consortium for Ocean Drilling (Belgium, Denmark, Finland, Iceland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and Turkey) and the People's Republic of China. The program is managed by Joint Oceanographic Institutions, a consortium of 10 U.S. institutions, with Texas A&M University responsible for science operations. Lamont-Doherty Earth Observatory is the operator for downhole logging.

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In addition, the ODP Web Site includes much additional information on this leg (Leg 183 Scientific Prospectus) and will carry weekly reports on progress as the leg proceeds.  
<http://www-odp.tamu.edu/>