

NEWS RELEASE

Ocean Drilling Program



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ODP Leg 124.2

COLLEGE STATION, TX -- A violent history of crustal plate collision, mountain building and erupting volcanoes marks the origin and evolution of two Southeastern Asian basins, scientists for the Ocean Drilling Program (ODP) recently discovered.

The scientists, who just completed a two-month drilling expedition in the Sulu and Celebes seas, also documented evidence of a previously undiscovered reversal in Earth's magnetic field.

Using ODP's drill ship, JOIDES Resolution, the scientists retrieved cores of sediment and rock from the two basins to determine their origin and geologic history. The sediment that accumulated in the two sea basins, which separate the Philippines from the Indonesian islands of Borneo and Sulawesi, record the history of the collisions between the island chains and microcontinents.

The scientists discovered that the Celebes Sea is a piece of an ancient ocean basin that formed 42 million years ago in a setting far from any land mass. By 20 million years ago, crustal movement had pushed the Celebes basin close enough to the Indonesian and Philippine volcanoes to receive volcanic debris. By 10 million years ago the Celebes Sea was inundated with continental debris, including coal,

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which was shed from a rapidly growing young mountain on Borneo. By this time the basin had docked against Eurasia.

As the Celebes Sea was bumping against Eurasia 15 million years ago, tremendous volcanic activity just to the north created another new basin. A large volcanic chain, the Cagayan ridge, rapidly erupted, then split to form the Sulu Sea on its south side, creating one of the smallest marginal basins in the western Pacific. Soon after the Sulu Sea was born, the Cagayan ridge died and has remained inactive.

Scientists discovered that the earliest deposits in the young Sulu Sea were thick avalanches of volcanic flows that rushed down the flanks of the ridge and blanketed the Sulu abyssal plain. This activity occurred simultaneously with the Cagayan ridge's collision on its north side with a semi-submerged fragment of China, called Dangerous Grounds.

Ten million years ago the Sulu Sea, like the Celebes, was inundated with debris from mountain building on Borneo, the same event that covered the Celebes Sea.

At the same time, the eastern side of the Sulu Sea was smashed by the early Philippine archipelago. The effect of the Philippine collision can still be seen in both the Sulu and Celebes seas. The scientists measured the forces of this collision in the drill holes with a special sonic tool.

Scientists also discovered a reversal of Earth's magnetic field that occurred 1.1 million years ago. The reversal, which was previously unknown, was first found in the Sulu Sea and confirmed in the Celebes Sea.

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Earth's magnetic field has reversed itself through time. During normal magnetism, the north and south magnetic poles are in their present positions. During times of reversal, their locations are opposite. Magnetic minerals in volcanic and sedimentary rocks indicate what direction north was when the rocks were formed.

This phenomenon gives scientists a unique method of measuring the relative ages of ocean basins. As ocean crust forms and moves away from a spreading center, its age can be tracked by recording magnetic field reversals.

Specialists on board the ship studied the magnetic character of the sediments from the two sea basins using a superconducting, highly sensitive device called a cryogenic magnetometer. The tiny magnetic particles showed that 1.1 million years ago Earth's magnetic field rapidly changed polarity, one of the shortest full reversals yet discovered.

Scientists will use this data in addition to the cores of rock and sediment retrieved during drilling to interpret how small ocean basins trapped by islands and microcontinents originate and evolve. This information will be used to look at ancient weather patterns, volcanic activity, mountain-building processes and global sea-level changes through time.

Co-chief scientists for the cruise were Dr. Eli Silver, University of California at Santa Cruz, and Dr. Claude Rangin, Universite Pierre et Marie Curie, Paris, France. Dr. Marta von Breyman, Texas A&M University, College Station, was the staff scientist.

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Twenty-seven scientists from the United States as well as Canada, Italy, the Federal Republic of Germany, France, Japan, the Netherlands, the Philippines and the United Kingdom participated in the cruise. The ship left Singapore on Nov. 9, 1988, and arrived in Manila, the Philippines on Jan. 4, 1989.

JOIDES Resolution, registered as SEDCO/BP 471, is the research vessel for ODP, which is funded by the United States National Science Foundation, the Australian and Canadian Consortium for the ODP, the European Science Foundation Consortium for the ODP, France, Japan, West Germany 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, paleomagnetism 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, in the Texas A&M University Research Park, 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.

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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.

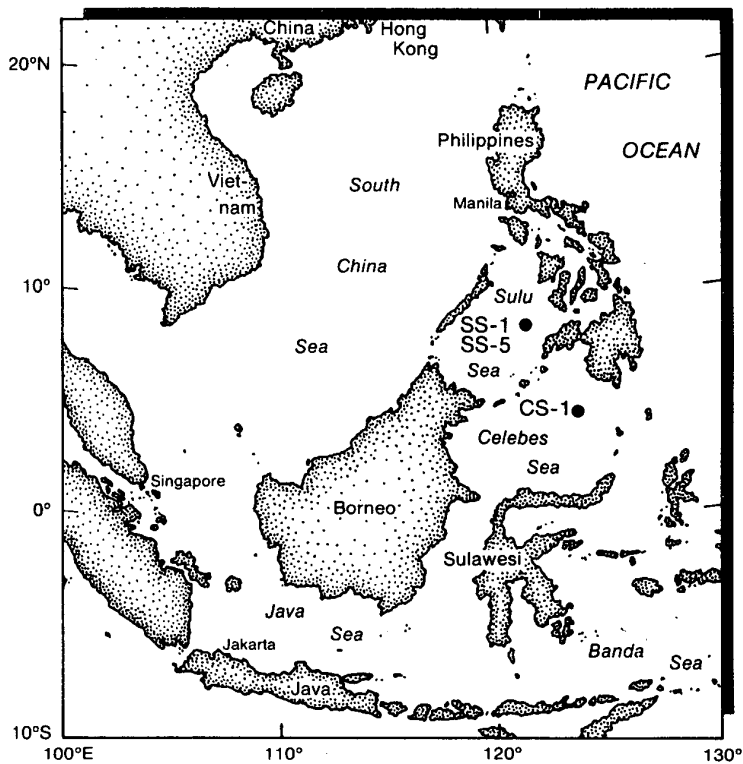
"This cruise marks our initial expedition into the Western Pacific," said Dr. Philip D. Rabinowitz, director. "We'll be drilling in this region throughout 1989," he said.

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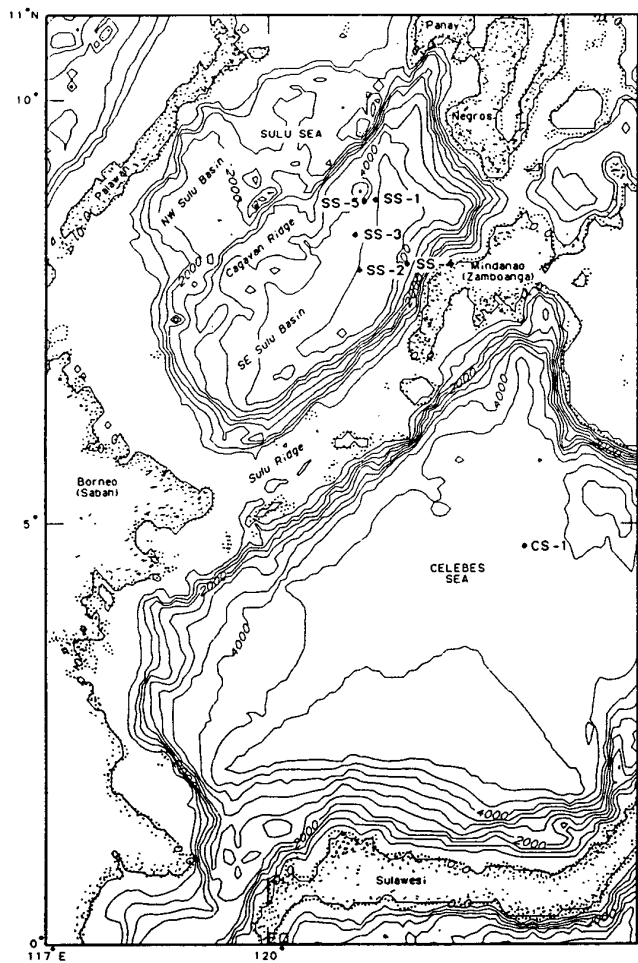
(Note: JOIDES institutions are: University of California at San Diego; Columbia University; University of Hawaii; University of Miami; Oregon State University; University of Rhode Island; Texas A&M University; University of Texas at Austin; University of Washington; and Woods Hole Oceanographic Institution.

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 for Leg 124 were: Co-chief Scientists Dr. Eli Silver, University of California, Santa Cruz and Dr. Claude Rangin, Universite Pierre et Marie Curie, Paris, France; Garrett W. Brass, University of Miami; Ulrich Berner, Federal Institute of Geosciences and Natural Resources, Hannover, Federal Republic of Germany; Philippe Bertrand, Universite d'Orleans, France; Christian Betzler, Institut und Museum fur Geologie und Palaontologie, Tubingen, Federal Republic of Germany; Marta von Breyman, Texas A&M University, College Station; Vindell Hsu, Louisiana State University, Baton Rouge; Zehui Huang, Dalhousie University, Halifax, Nova Scotia, Canada; Rich Jarrard, Lamont-Doherty Geological Observatory, Palisades, N.Y.; Stephen Lewis, U.S. Geological Survey, Menlo Park, Calif.; Braddock K. Linsley, University of New Mexico, Albuquerque; Dean Merrill, Texas A&M University; Carla M. Muller, Universitaet Frankfurt, Federal Republic of Germany; Alexandra Nederbragt, Institut voor Aardwetenschappen, Amsterdam, the Netherlands; Gary Nichols, University College of London, United Kingdom; Manuel Pubellier, Universite Pierre et Marie Curie, Paris; Fernando M. Sajano, Philippine Institute of Volcanology and Seismology, Quezon City; Reed P. Scherer, Ohio State University, Columbus; Der-Duen Sheu, University of Oklahoma, Norman, Okla.; Hidetoshi Shibuya, University of Osaka, Japan; Jih-Ping Shyu, Texas A&M University; Randall Smith, Tulane University, New Orleans, La.; Terrence Smith, University of Windsor, Ontario, Canada; Renato V. Solidum, Philippines Mines and Geosciences Bureau, Quezon City; Piera Spadea, Istituto di Scienze della Terra, Udine, Italy; and Dwayne D. Tannant, Edmonton, Alberta, Canada.



Sites for Ocean Drilling Program Leg 124
Southeast Asia Basins November-December 1988.



Bathymetric map of the Celebes and Sulu Seas and the Cagayan Ridge. (Sites drilled are indicated by SS and CS. Contour interval of 500m.)