ODP DATA DESCRIPTION

INTRODUCTION

The Ocean Drilling Program (ODP) was an international partnership of scientists and governments that joined together to explore the structure and history of the earth beneath the ocean basins. The central purpose of ODP was to provide core samples, downhole measurements and other scientific measurements to characterize the oceans' basins. The data generated are leading to a better understanding of the processes of plate tectonics, earth's crustal structure and composition, conditions in ancient oceans, and changes in climate through time.

As the Science Operator, Texas A&M University (ODP-TAMU) had the responsibility to collect cores from the oceans basins, provide adequate facilities for the analyses of the cores, and assure the preservation of the core and scientific data collected by shipboard scientists. This program was very successful – ODP repositories hold over 220 km of core and the databases contain millions of analytical measurements made on core sections and samples. By providing the drilling platform, consistent drilling procedures, on-board laboratories equipped with analytical equipment, and standard data collection procedures, the ODP has created a suite of analyses from locations all over the world's oceans that are directly comparable.

PRIME SCIENTIFIC DATA

One of the primary tasks of the science operator was to collect, archive and disseminate scientific data collected on the core during the cruises. Table 1 contains a list of the prime data types – analyses performed on the ship during a cruise with standard data collection procedures on all core when practical.

Prime Scientific Data	Data Availability	Leg first collected
Operations and Core Summary		
Leg summary and details	Janus	101
Site summary	Janus	101
Hole operations summary	Janus	101
Core summary	Janus	101
Lithology and Stratigraphy		
Visual Core Description	Janus – primedata images Initial Report volumes	101
Core Photos	Janus – scanned photographs	101
Reentry Video	Data Librarian – see Table Ax	
Digital Scanning of Sections	Janus	198
Spectral reflectance and colorimetry	Janus	154
Paleomagnetism	Janus	103
Tensor	Janus	174
Smear Slides and Thin Sections	Data Librarian Initial Reports volumes	101
Biology and Stratigraphy		
Paleontology	Janus *	101
Age Profile	Janus *	101
Microbiology	Data Librarian	185
Geochemistry and Mineralogy		
Carbon / Carbonate Content	Janus	101
Gas Chromatography	Janus	101
ICP - AES	Janus	187
Interstitial Water	Janus	101
Rock Evaluation	Janus	101
X-ray Fluorescence	Janus	106
X-ray Diffraction	Janus	106
Physical Properties		
Gamma Ray Attenuation	Janus	101
Index Properties	Janus	101
Magnetic Susceptibility	Janus	104
Natural Gamma Radiation	Janus	150
P-wave Velocity (logger)	Janus	108
Shear Strength	Janus	101
Sonic Velocity (samples)	Janus	101
Thermal Conductivity	Janus	101
Temperature and Geophysics		
Downhole Temperature	Janus	104
Underway Geophysics and Bathymetry	NGDC Data Librarian	101
Seismic Surveys	Data Librarian – see Table Axx	101

* Migration of these data to be completed by 2007. Contact Data Librarian for information.

General Definitions

LEG

The Ocean Drilling Program started numbering the scientific cruises of the *JOIDES Resolution* at Leg 101. (Leg 100 was a trial run of the modified drilling ship.) A leg was nominally two months duration. The shipboard science party typically consisted of 25 scientists drawn from universities, government and industry around the world. During the 19 years of the ODP, there were 110 cruises on the *JOIDES Resolution*.

SITE

A site is the location where one or more holes were drilled while the ship was positioned over a single acoustic beacon. The *JOIDES Resolution* visited 656 unique sites during the course of the ODP. Some sites were visited multiple times, including some sites originally visited during the Deep Sea Drilling Program for a total of 673 site visits.

HOLE

Several holes were drilled at a single site by pulling the drill pipe above the seafloor, moving the ship some distance away and drilling another hole. The first hole was designated 'A' and additional holes proceeded alphabetically at a given site. Location information for the cruise was determined by hole latitude and longitude. During ODP, there were 1818 holes drilled or deepened.

CORE

Cores are numbered serially from the top of the hole downward. Cored intervals are up to 9.7 m long, the maximum length of the core barrel. Recovered material was placed at the top of the cored interval, even when recovery was less than 100%. More than 220 km of core were recovered by the ODP.

CORE TYPE

All cores are tagged by a letter code that identifies the coring method used. Some of the more common core types are listed below. A numerical core type indicates an interval that was drilled, not cored.

- H – APC - The Advanced Piston Core is a hydraulically actuated piston corer designed to recover undisturbed core from soft sediments. It is designed to be delivered through the drill string to the sediment to be cored whether at the sea floor or hundreds of meters below it.
- X – XCB - The Extended Core Barrel is designed to recover core samples from soft to medium formations. Typically, the XCB is deployed upon APC refusal, i.e., when a formation becomes too stiff to piston core. The XCB relies on rotation of the drill string to advance the hole and cut the formation.
- R – RCB - The Rotary Core Barrel is designed to recover core samples from medium to hard formations. The RCB relies on rotation of the drill string to advance the hole and cut the core. The core bit trims the sample.
- W – WASH - When washing down a hole, drilling rates are higher if a core barrel is used rather than blocking the drill bit with a center bit device, even though no core is desired. The driller may wash down a hole as many meters as desired without retrieving a core.
- G - A ghost core is one whose contents come from an already drilled part of the hole, i.e., the extent of a ghost core lies completely within the drilled or cored portion of a hole.
- P – PCS - The Pressure Core Sampler is capable of retrieving core samples from the ocean floor while maintaining near in-situ pressures up to 689.7 atmospheres (10,000 psi).

- M – MISC - This represents material that could not be labeled with a standard core type. This category includes limited numbers of cores which are recovered using experimental drilling methods which, once they are established, are assigned their own core type.
- Z – DIAM - Diamond Coring bits are being developed to enhance recovery of core in hard rock.
- N MDCB - The Motor Driven Core Barrel is a wireline-retrievable coring system designed for a two-fold purpose. It allows a single bit APC/XCB holes to be extended to greater depths and into more indurated formations. The MDCB can also improve recovery in difficult formations.

SECTION

Cores are cut into 1.5 m sections in order to make them easier to handle. Sections are numbered serially, with Section 1 at the top of the core. Most of the scientific measurements were made on sections or discrete samples taken from the sections. Samples and measurement intervals are given in centimeters from the top of each section. After being cut into sections, several whole-core measurements were made, then the core was split into working and archive halves. The archive halves were used for the visual descriptions, paleomagnetics and photography. The working halves were sampled for shipboard and shore-based studies.

Operations and Core Summary

LEG

SITE

HOLE

CORE

Lithology and Stratigraphy

VISUAL CORE DESCRIPTIONS

Visual core descriptions (VCD) were usually hand-drawn by scientists for each section of the core. The sedimentary VCDs document lithology, structures, texture, color and anything else of interest. The individual descriptions were put together to produce the core barrel sheet which is published in the Initial Report volume.

Hard rock descriptions on barrel sheets (all sections of a core) were often too compressed to provide adequate information, so the hard rock VCDs were published for more complete graphic representation.

All VCDs were returned to ODP-TAMU after the cruise. They were microfilmed and archived. Recently, all the microfilm images have been scanned and those scanned images are being made available through Janus using web query Primedata Images.

CORE PHOTOGRAPHY

Core photographs were taken of each core soon after the core had been split. All sections of a core were set up on the core table in order to control both lighting conditions and scale. Photographs of the cores under controlled conditions were important in order to capture each core's true color.

Recent advances in technology have given us the capability to scan the core photographs at high resolution. In addition to the published core photos in the IR volumes, these images are available through Janus using the Core Photo web query (300 bpi PDF format). Full resolution images (1200 bpi tiff format) can be requested from ODP-TAMU Data Librarian.

DIGITAL SECTION PHOTOGRAPHY

Digital scanning of sections was implemented on Leg 198. These data are available through Janus Core Photo web query. These images are available in jpg format.

COLOR REFLECTANCE and COLORIMETRY

The Minolta photospectrometer was used to measure the reflected light from the surface of the core over the visible spectrum (400 - 700 nm). In addition to the spectral measurements, the data acquisition program also calculated some standard color parameters: tristimulus values X Y Z, CIELAB system L*a*b*, and Munsell HVC (hue, value and chroma).

Color reflectance data are available through the Janus web query Color Reflectance. The query gives the user the option of retrieving the spectral reflectance percentages for each wavelength. Additional information about ODP Color Reflectance data can be found in *Technical Note 26: Physical Properties Handbook,* Chapter 7.

PALEOMAGNETISM

Shipboard paleomagnetists provided the first paleomagnetic analysis of sediments and rocks recovered by ODP. This information was used by shipboard and shore-based scientists as the basis for further sampling and study, and for forming the first general conclusions about the geologic history of the drilling site. The paleomagnetism laboratory on the *JOIDES Resolution* was equipped with a wide range of equipment: magnetometers (cryogenic, spinner, fluxgate, Hall-effect), demagnetizers (alternating field, thermal), rock-magnetic equipment (Bartington susceptibility meter, Kappabridge susceptibility system for measuring anisotropy, impulse magnetizer for measuring isothermal remanent magnetization, partial anhysteretic remanent magnetizer).

The bulk of the paleomagnetic data was collected with a three-axis, pass-through cryogenic (superconducting) magnetometer. Normally, archive-half sections were run for continuous NRM (natural remanence magnetization) or demagnetized remanence measurements. Scientists also ran discrete samples through the cryogenic magnetometer. Archive sections were typically not subjected to fields higher that 20 mT, but discrete samples could be demagnetized in much higher fields or by other methods.

Most of the continuous paleomagnetic data are available through the Janus web query Cryomagnetometer. Some of the discrete sample data are also available. Although most of the raw paleomagnetic data are in the Janus database, the query currently does not have an

option of retrieving those data. For additional information, contact the ODP-TAMU Data Librarian. Additional information about ODP Paleomagnetic data measurements can be found in *Technical Note 18: Handbook for Shipboard Paleomagnetists.*

CORE ORIENTATION

Oriented cores potentially provided the best paleomagnetic information. The ODP used two different downhole tools to measure *in-situ* core orientation, the Eastman-Whipstock Multishot tool and the Tensor tool. Both tools required additional setup time and special equipment like a nonmagnetic drill collar. The multishot tool could be used only with APC coring, but the Tensor tool could provide continuous orientation information during rotary coring also.

Some Tensor orientation information is available though the Janus web query Tensor. For additional information and data for the multishot and Tensor tools, contact the ODP-TAMU Data Librarian. Additional information about ODP core orientation measurements can be found in *Technical Note 18: Handbook for Shipboard Paleomagnetists.*

SMEAR SLIDES AND SEDIMENTARY THIN SECTIONS

Smear slide and thin section data contain the microscopic evaluations of samples for their mineral content, fossil content, and other petrographic properties. Smear slides were initially intended to be a quick look at samples for mineral or fossil content. Some of these data are reported in the Initial Report volumes. These data have been archived at ODP-TAMU. For additional information on data availability, contact the ODP-TAMU Data Librarian.

HARD ROCK THIN SECTIONS

Thin sections are a primary tool for hard rock geologists and petrologists. Analyses of thin sections lead to understanding of the composition of the oceanic crust, evolution of the structure of oceanic basins, mantle composition, fluid flow, alteration processes and many other scientific investigations.

Thin sections that were made during cruises have been archived at OPD-TAMU. Scientists' detailed analyses and descriptions were also archived at ODP-TAMU. Many of these were published in the Initial Report volumes. For additional information about thin sections and the analyses, contact the ODP-TAMU Data Librarian.

Biology and Stratigraphy

PALEONTOLOGY

Paleontological data were collected by scientists analyzing smear slides and samples. During the ODP, data have been collected on the following fossil groups: nannofossils, radiolarians, benthic foraminifers, planktonic foraminifers, diatoms, dinoflagellates/acritarchs/prasinophytes, pollen/spores, silicoflagellates/ebridians-/actiniscidians, bolboforms and ostracods.

Several different types of paleontological data were collected and analyzed during ODP cruises. Individual sample analyses that were reported as range charts are being migrated

to Janus. Information concerning taxons, datums, and zones are being incorporated into extensive dictionaries. Additional information about ODP paleontological investigations can be obtained by contacting the ODP-TAMU Data Librarian.

AGE PROFILE

Using age information obtained from cores and appropriate depth scales, one or more age models can be constructed for a hole or site. The age model then allows calculation of age as an independent variable for core and downhole data.

Preliminary age profiles were typically determined by the scientific party during the cruise using paleomagnetic and biostratigraphic data. Those data were usually published in the ODP Initial Reports. Some age profile data are being migrated to the Janus database along with more detailed age profile information that may have been published in the ODP Scientific Reports volumes. Some age profile data can be obtained through the Janus web query Age Profile. Additional information about ODP age profile information can be obtained by contacting the ODP-TAMU Data Librarian.

MICROBIOLOGY

Late in the ODP, deep biosphere research attracted much attention as large microbial communities had been discovered deep within the sea floor. Methods are still being developed for recovering suitable cores for microbiological study. Tracer experiments were first conducted during ODP Leg 185 and involve the delivery of both chemical and particulate tracers during drilling and their quantification in the ODP cores. Additional information can be found in *Technical Note 28: Methods for Quantifying Potential Microbial Contamination during Deep Ocean Coring*.

Geochemistry and Mineralogy

CARBONATE CONTENTS

Carbonate data obtained from samples contributed to a wide range of studies. Calcium carbonate content of cores was used for sedimentological and lithostratigraphic classification purposes. Organic carbon content (directly or by difference) provided valuable evidence for ocean paleoenvironmental studies and depositional environment classification. Carbon to nitrogen ratios were used to infer the nature of the organic matter (e.g., land or aquatic plant material) preserved in cores. Molecular organic geochemical analyses such as alkenone unsaturation can be used to infer marine paleotemperature information.

Carbon has been analyzed on a variety of instruments over the course of the ODP. Typical analyses of samples produced data as weight percentages of inorganic carbon, organic carbon, total carbon, calcium carbonate, nitrogen, and sulfur. Although other carbonates may be present, all acid-soluble carbon was calculated as calcium carbonate.

Carbonate measurements are available through the Janus web query Carbonates. Additional information about carbon measurements can be found in *Technical Note 30: Introduction to Shipboard Organic Geochemisry on the JOIDES Resolution.*

ROCK EVALUATION

Rock Evaluation analyses were used to evaluate type and maturity of organic carbon, calculate petroleum potential, and detect oil shows. These data were also used on the ship as an interpretive tool for monitoring hydrocarbon safety levels.

The Rock Evaluation data were generated using the Delsi Nermag Rock-Eval II Plus TOC instrument for whole rock or sediment pyrolysis. Five basic parameters, S1, S2, S3, temperature max and total organic carbon, were measured that would allow the calculation of these additional parameters: productivity index (PI), petroleum potential or pyrolyzed carbon (PC), hydrogen index (HI), and oxygen index (OI).

Rock Evaluation measurements are available through the Janus web query Rock Eval. Additional information about ODP rock evaluation measurements can be found in *Technical Note 30: Introduction to Shipboard Organic Geochemisry on the JOIDES Resolution.*

GAS CHROMATOGRAPHY

One of the primary reasons for the analysis of gas samples was hydrocarbon monitoring. The *JOIDES Resolution* was not properly equipped to drill in areas where oil or gas might be encountered. Proposed sites were intensively studied and reviewed in order to ensure locations did not have factors conducive to hydrocarbon accumulation. Headspace gas samples and gas from expansion pockets seen through liners were analyzed as part of an active monitoring program. In addition to hydrocarbons, gases such as hydrogen sulfide represented a potential safety problem.

Gas analyses data were collected on headspace samples (gas obtained from sediment samples) and vacutainer samples (void pockets within the core before the liner has been breached). Headspace and vacutainer analyses were done to determine the composition and concentration of hydrocarbons using gas chromatographs.

Both headspace and vacutainer gas analyses are available through the Janus web query Gas Elements. The user has the option of specifying sample type, detector type and instrument used for obtaining the measurements. Additional information about ODP gas analyses can be found in *Technical Note 30: Introduction to Shipboard Organic Geochemisry on the JOIDES Resolution.*

INTERSTITIAL WATER

Understanding the nature of the water in the ocean and within the rocks and sediments that create the oceans' floors is fundamental to all aspects of oceanography and earth's evolution. Interstitial water chemistry can be used to study processes related to the deposition, decomposition, and preservation of organic matter; deposition of minerals, alteration of rock, growth of microbial communities deep in the crust, and many other scientific studies.

Interstitial (or pore) water data contain the results of analyses performed on water samples extracted from cores and water samples collected by a downhole instrument, either sea water or borehole water. Different analytical instruments and methods were used in the collection of the suite of analytical measurements made on interstitial waters. Among the measurements routinely collected are: pH, alkalinity, salinity, chlorinity, calcium, magnesium, sulfate. Newer technology and instrumentation has increased the number of chemical constituents that can be identified.

Interstitial water data can be obtained through the Janus web query Interstitial Water. Additional information about ODP interstitial water data collection can be found in *Technical Note 15: Chemical Methods for Interstitial Water Analysis aboard JOIDES Resolution* and *Technical Note 29: Analyis of Major and Trace Elements in Rocks, Sediments, and Interstitial Waters by Inductively coupled Plasma-Atomic Emission Spectrometry (ICP-AES)*.

INDUCTIVELY COUPLED PLASMA–ATOMIC EMISSION SPECTROMETRY

ICP-AES is an emission spectrophotometric technique to provide rapid, quantitative analysis of a variety of sample types. Igneous and sedimentary rocks, sediments and interstitial waters may all be analyzed for a comprehensive suite of major and trace elements.

The ICP-AES instrument was installed on board the *JOIDES Resolution* on Leg 187. ICP-AES took the place of XRF analyses of hard rocks in addition to the analysis of interstitial waters.

ICP-AES data can be obtained through the Janus web queries Interstitial Water and ICP-AES. The interstitial water query gives the user the option of having the method of analysis returned with the analytical result. Additional information about ODP ICP-AES measurements can be found in *Technical Note 29: Analyis of Major and Trace Elements in Rocks, Sediments, and Interstitial Waters by Inductively coupled Plasma-Atomic Emission Spectrometry (ICP-AES)*.

X-RAY FLUORESCENCE

X-ray fluorescence (XRF) spectrometry data contain concentrations of certain major and/or trace elements. These data are collected by means of an X-ray fluorescence spectrometer. This device determines elemental concentrations by analyzing the intensities and wavelengths of secondary X-rays produced when a sample is irradiated by primary X-rays. Major elements are reported in oxide percentage and trace elements are reported in elemental parts per million (ppm; except for Titanium, which is reported in elemental percentage).

X-RAY DIFFRACTION

X-ray diffraction (XRD) analyses allow the identification of minerals based on the precept that no two substances will alter the path of an incident x-ray beam absolutely identically. With this instrument scientists can quickly evaluate the mineralogical composition of sediments and the alteration products of ocean crust material.

Physical Properties

MOISTURE AND DENSITY

Moisture content and mineral density (MAD) are basic sediment and rock properties that are determined most accurately through mass and volume determinations. MAD data are the only data that provide a direct estimate of porosity and void ratio and the average density of the minerals. Porosity variations are controlled by consolidation and lithification, composition, alteration, and deformation of the sediments or rocks.

Index properties are calculated using wet and dry mass measurements taken with electronic balances and wet and dry volume measurements taken with a helium displacement pycnometer. Four different methods of calculating the index properties have been used during the ODP; Method C is considered the most accurate for saturated samples; Method D was developed for unsaturated samples. The properties that are calculated from these data are: wet bulk density, dry bulk density, grain density, wet water content, dry water content, porosity and void ratio.

Moisture and Density data are available through the Janus web query Moisture & Density. The user has the option of requesting all the raw measurements and beaker information. Additional information about ODP Moisture and Density measurements can be found in *Technical Note 26: Physical Properties Handbook,* Chapter 2.

GAMMA RAY ATTENUATION

Bulk density of sediments and rocks can be estimated from the measurement of gamma-ray attenuation (GRA). The principle is based on the facts that medium-energy gamma rays (0.1–1 MeV) interact with the formation material mainly by Compton scattering, that the elements of most rock-forming minerals have similar Compton mass attenuation coefficients, and that the electron density measured can easily be related to the material bulk density. GRA data provide a precise and densely sampled record of bulk density, an indicator of lithology and porosity changes. The records are frequently used for core-to-core correlation.

Gamma ray attenuation (GRA) data consist of individual records that represent a density evaluation at a given point in a whole-round core. The GRA system was the first system installed on a track which eventually became the MultiSensor Track (MST), a multiprocessor, multisensor data collection system that took measurements on cores from several sensors simultaneously. The MST was designed to handle all sampling automatically for GRA, MSL, NGR and PWL.

GRA bulk density data are available through the Janus web query Bulk Density. The user has the option in the query of getting the raw data and calibration information. Additional information about ODP GRA Bulk Density measurements can also be found in *Technical Note 26: Physical Properties Handbook,* Chapter 3.

MAGNETIC SUSCEPTIBILITY

Magnetic susceptibility is the degree to which a material can be magnetized in an external magnetic field. Magnetic susceptibility is used mostly as a relative proxy indicator for changes in composition that can be linked to paleoclimate-controlled depositional processes. The high precision and sensitivity of susceptibility loggers makes this measurement extremely useful for core-to-core and core-downhole log correlation.

A Bartington Instruments susceptibility system, MSL (magnetic susceptibility logger) was integrated into the MST to measure the susceptibility of the whole-round core sections. The Bartington instrument output values are relative, volume-specific susceptibilities which are currently not corrected, so they cannot be reported in SI units. Late in ODP, a split-core track was built to measure point susceptibilities with a Bartington magnetic susceptibility probe MS2F.

Both types of magnetic susceptibility data are available through the Janus web queries Magnetic Susceptibility (MSL) and Point Susceptibility. The user has the option in the query of getting additional data acquisition information. Additional information about ODP Magnetic Susceptibility measurements can also be found in *Technical Note 26: Physical Properties Handbook,* Chapter 4.

NATURAL GAMMA RAY

Gamma rays are electromagnetic waves with frequencies between 10^{19} and 10^{21} Hz. They are emitted spontaneously from an atomic nucleus during radioactive decay, in packets referred to as photons. Natural Gamma Ray (NGR) measurements are used for three purposes: (1) correlation of core-to-core and core-downhole log; (2) evaluation of the clay/shale content of a formation; and (3) abundance estimates for radioisotopes K, U, and Th. Minerals that fix K, U, and Th, such as clay minerals, are the principal source of NGR. Other examples include arkosic silt and sandstones, potassium salts, bituminous and alunitic schists, phosphates, certain carbonates, some coals, and acid or acido-basic igneous rocks.

NGR scintillation counters were added to the MST on Leg 150. The early version of the data acquisition program collected the spectral data in five energy windows compatible with the Schlumberger natural gamma tool. When advancements in technology allowed downhole tools to move to acquisition of the full 256-channel spectral data, the MST NGR did also.

NGR data are available through the Janus web query Natural Gamma Radiation. The query gives the user the option of getting additional run information, e.g., background counts and data acquisition parameters and the spectral counts. Additional information about ODP Natural Gamma Radiation measurements can also be found in *Technical Note 26: Physical Properties Handbook,* Chapter 5.

P-WAVE VELOCITY

P-wave or sonic velocity measurements are a measure of the velocity of seismic waves through earth materials, distance versus time. *P*-wave velocity varies with the lithology, porosity, and bulk density of the material; state of stress, such as lithostatic pressure; and fabric or degree of fracturing. In marine sediments and rocks, velocity values are also controlled by the degree of consolidation and lithification, fracturing, occurrence and abundance of free gas and gas hydrate. Together with density measurements, sonic velocity is used to calculate acoustic impedance, or reflection coefficients, which can be used to estimate the depth of reflectors observed in seismic profiles and to construct synthetic seismic profiles.

P-wave velocities were measured on four different systems:

- The PWL (*P*-wave logger), mounted on the multisensor track, measured distance and time horizontally though the whole-core (unsplit) section, with or without the core liner. Measurements were taken at a set interval, e.g., every 5 cm, along the length of the section.
- Discrete velocity measurements were made on split sections or samples. Two transducers pairs, PWS1 and PWS2, were designed to be inserted into soft and semiconsolidated sediments. They were mounted orthogonal to each other to measure along the core axis (PWS1, z-direction) and perpendicular to the axis and within the split plane (PWS2, y-direction). The third set of transducers, PWS3, allowed measurement on the split core in any direction including perpendicular to the split plane (x-direction), with or without the core liner, and samples.

P-wave data are available through Janus web queries: *P*-wave Velocity (PWL) and *P*-wave Velocity (PWS). The queries give the user the option of also retrieving the raw

measurement data. Additional information about ODP *P*-wave velocity measurements can also be found in *Technical Note 26: Physical Properties Handbook,* Chapter 6.

SHEAR STRENGTH

Shear strength measurements are performed to test sediments and rocks to determine their stress-strain-time behavior. Some materials are brittle and exhibit little stress when strained (rocks); others are work-hardening (e.g., compacted clays and loose sands) or work-softening. In the clayey, soft, saturated, marine sediments often measured for strength, stress decreases as the sediment is strained beyond a peak stress. The sediment yields (fails) at the peak stress, which can be defined as the sediment's strength. Shear strength, or shear resistance, of sediments is the most important aspect of slope stability. However, the shear strength values obtained onboard do not alone allow any slope stability analysis. They represent a relative strength profile.

Shear Strength tests have been done with several different devices: Motorized Torque Transducer, Automated Vane Shear, Wykeham-Farrance, hand-held Torvane, and SoilTest Pocket Penetrometer. The tests were run on whole-core samples (into the end of the core), on split core samples (into the split core surface), or on remolded sediment samples.

These data are available through Janus web query Shear Strength. The query gives the user the option to choose type of measurement and retrieving raw measurement data. Additional information about ODP shear strength measurements can also be found in *Technical Note 26: Physical Properties Handbook,* Chapter 9.

THERMAL CONDUCTIVITY

Thermal conductivity is a measure of the rate that heat flows through material. In marine geophysics, mainly thermal conductivity profiles of sediment and rock sections are used, along with temperature measurements, to determine heat flow. Heat flow is not only characteristic of the material, but an indicator of type and age of ocean crust and fluid circulation processes at shallow and great depths.

Thermal conductivity data were collected using two different systems. Both operate by inserting probes into the core material and measuring the changes in temperature. The conductivity is a calculated value relating the change in the temperature per unit time.

Thermal conductivity data are available through the Janus web query Thermal Conductivity. Janus only contains the calculated conductivity value; the raw data are archived at ODP-TAMU. Contact ODP-TAMU Data Librarian for additional information. Additional information about ODP thermal conductivity measurements can also be found in *Technical Note 26: Physical Properties Handbook*, Chapter 8.

Temperature and Geophysics

DOWNHOLE TEMPERATURE

Several tools have been used during the ODP to collect borehole and formation temperature data. The temperature data are available through the Janus web query Downhole Temperature.

- Adara was a temperature tool compatible with the APC coring system. It resided in the APC cutting shoe and measured formation temperature while the APC core was being retrieved. This tool was first deployed on Leg 139. These measurements were usually made down to ~100-150 meters below the seafloor until the coring method switched to XCB.
- The Davis-Villinger Temperature Probe (DVTP) was designed to take heat-flow measurements in semiconsolidated sediments that were too stiff for APC coring. Coring must be interrupted to take a temperature measurement with DVTP. The DVTP could also be run on wireline and hung below the bit as a temperature logging tool for borehole fluids.
- The water sampling temperature probe (WSTP) was a temperature tool compatible with the XCB coring system and was used in formations that were too stiff for APC coring. It was also used to obtain water samples from the ocean bottom, borehole or the formation.

UNDERWAY GEOPHYSICS

Navigation and bathymetric were continually recorded during a cruise. An onboard GPS system provided position and velocity information. Two precision depth recorders, the 3.5 kHz system (underway) and 12 kHz (on-site), provided bathymetry. A Proton Precession Magnetometer was often deployed to collect underway magnetic data. These data were recorded and archived in *mgd77* format, the standard format of the Intergovernmental Oceanographic Commission. All ODP mgd77 files are archived at the National Geophysical Data Center (NGDC), Marine Trackline Geophysics http://www.ngdc.noaa.gov/mgg/geodas/trackline.html .

Bathymetric data were also recorded on chart recorders. Paper rolls returned to ODP-TAMU after the end of cruise were microfilmed, then both paper rolls and microfilm were archived at ODP-TAMU. See file pdr.xls for data availability. Contact ODP-TAMU Data Librarian for additional information.

SEISMIC SURVEY

Single-channel seismic site surveys were sometimes done to locate the position for drilling. The seismic data were processed in the Underway Geophysics Laboratory on the ship. Data were also recorded on chart recorders. The digital seismic data and the paper rolls are archived at ODP-TAMU (see file seismic.xls for available data). Contact ODP-TAMU Data Librarian for additional information.