ODP Logging Service Report

Joint SCIMP and iSCIMP Meetings

June 17-19, 2002
College Station, Texas

Executive Summary

Leg 200 H2O
The primary objective of Leg 200 was to drill a reentry hole within 2 km of the H2O junction box for the installation of a borehole seismometer. The character of the basement interval is well imaged by the logs, identifying a thick basalt flow overlying low-velocity pillows and breccias. This borehole information will assist in planning for future seismometer emplacement.

Leg 201 Peru Biosphere
Leg 201 was designed to sample the microbial biosphere of deep marine sediments and the ocean crust. The Triple Combo was run at all logged holes and was useful for fine scale core-log integration at all sites and completing the incomplete sedimentary column at Sites 1228 and 1229. The FMS/Sonic was added at Hole 1230A in order to use the velocity log and the FMS images to detect and characterize hydrate-bearing intervals. The log data delineate several intervals where gas hydrate may also have been present but not recovered in the core.

Leg 202 SE Paleoceanography
Leg 202 was underway at the time of this report. Its objective is to assess climate and oceanographic changes in the southeast Pacific in the Neogene. To date, two holes have been logged. Using the downhole log records as a depth reference, the core measurements were mapped to equivalent log depths (ELD) using Sagan in order to more precisely identify the size and position of core breaks. As a result, we are able to identify the cycles missing in core records, improving the prospects for developing an orbitally tuned age model.

Drillstring Measurements System (DMS)
The DMS project consists of two collaboratively engineered devices – the Downhole Sensor Sub (DSS) and the core barrel Retrievable Memory Module (CB-RMM) – that interface downhole to provide near real-time engineering data. Phase I of this project is underway with the DSA-XM tool modifications. Circuit prototyping has been completed and tool modifications are on track for Leg 204 deployment. Phase II (CB-RMM) will involve extending the DSA-XM to retrieve data from the DSS and is pending available funding.

Legacy Project
Fourteen legacy documents summarizing tools, tool strings, and software packages developed and employed by ODP Logging Services have been completed to date and several others are under development. In addition, user manuals and operations handbooks are being updated.

RAB Coring Project
This project is a joint effort among ODP Logging, Schlumberger, and TAMU to provide limited coring capabilities during RAB tool deployments. It is one component of the DOE Gas Hydrate program that was awarded to JOI for Leg 204 and other ODP activities. Tool design and assembly are on schedule and field testing is scheduled for June 14.

ODP Logging Service Report

I. STANDARD LOGGING OPERATIONS

Leg 200 H2O

The primary objective of Leg 200 was to drill a reentry hole within 2 km of the Hawaii-2 observatory (H2O) junction box for the installation of a borehole seismometer. Logging operations were conducted in Hole 1224F. The character of the basement interval is well imaged by the logs, identifying a thick basalt flow overlying low-velocity pillows and breccias. This borehole information will assist in planning for future seismometer emplacement.

The first ODP test run of the 3-component WST was planned for this leg to record the zero-offset vertical seismic profiles. When the WST-3 tool was in the drill pipe at a water depth of 1057 m, it was clamped to the pipe to conduct the test. Unfortunately, no source signals were generated or detected by the blast phone or the WST-3. Problems were identified and isolated with the air gun sources and the downhole telemetry; however, the experiment was terminated because limited time remained on site.

Leg 201 Peru Biosphere

Leg 201 was designed to sample the microbial biosphere of deep marine sediments and the ocean crust. Five holes were logged during Leg 201. Sites 1225 and 1226 in the Equatorial Pacific were aimed at open ocean locations composed mostly of biogenic sediments with low biological activity. Sites 1228 and 1229 on the Peru shelf consisted of primarily terrigenous sediments, extremely rich in organic material. Site 1230 was at the transition between the accreted sediments and the continental shelf. Its objective was to investigate the differences in the biologic community associated with the presence of gas hydrate. The Triple Combo was run at all five sites. The FMS/Sonic was added to the logging program at Hole 1230A in order to use the velocity log and the FMS images to better characterize the hydrate deposit in this location.

At Sites 1225 and 1226, core recovery was over 90%, and core measurements of density and porosity agree very well with logs, making possible fine scale core-log integration. Because of the low recovery below 100 mbsf at Sites 1228 and 1229, logs were crucial in completing the sedimentary column. At Site 1230, logs were instrumental in compensating for the low recovery in some sections, but were also of primary importance in detecting hydrate-bearing intervals. Gas hydrate was found in two cores, and its presence was inferred in three other cores. The resistivity and FMS logs and the velocity data delineate several additional intervals where gas hydrate may also have been present.

Leg 202 SE Paleoceanography

Leg 202 was underway at the time of this report. Its objective is to assess climate and oceanographic changes in the southeast Pacific in the Neogene. To date, two holes have been logged. The lithology and physical property changes recorded in sediments at Sites 1238 and 1239 provide evidence for orbitally paced climate, upwelling, and paleoproductivity changes within the eastern reaches of the equatorial cold tongue throughout the last ~11 m.y. The downhole density and natural gamma ray logs match core measurements down to the sub-meter scale over the length of the holes at both sites. Using the downhole log records as a depth

reference, the core measurements were mapped to equivalent log depths (ELD) using Sagan in order to more precisely identify the size and position of core breaks within the XCB section. Despite the high recovery, after mapping to the logs, the resulting gaps between cores (~1-3 m) are similar in scale to the dominant cycle length in the density and natural gamma-ray records. As a result, we are able to identify the cycles missing in core records, improving the prospects for developing an orbitally tuned age model based on sediment physical properties.

II. SPECIALTY TOOLS AND ENGINEERING DEVELOPMENTS

Drillstring Acceleration Tool Project

The DSA was ruggedized for use with the Fugro FPC (HYACINTH). All modifications were completed in time for the Leg 201 deployments. A modified tool (DSA-XM) will be deployed during Leg 204 (see DMS below) with both HYACINTH and ODP core barrels.

Drillstring Measurements System (DMS)

The Drillstring Measurement System (DMS) project consists of two collaboratively engineered devices – the Downhole Sensor Sub (DSS) and the core barrel Retrievable Memory Module (CB-RMM) – that interface downhole to exchange data and provide near real-time engineering data. The first phase of this project involves the modification of the DSA. The tool will be fitted with non-volatile memory that can be removed from the tool and placed in a reader attached to a desktop PC. The tool, renamed DSA-XM, will be deployed on Leg 204. The modifications will ensure that acquired data will be stored despite any potential loss of tool power. In addition, the memory configuration change will allow for much faster data transfer rates and thus increased tool turn-around time. To date, the circuit prototyping has been completed and the modifications are on track for the Leg 204 deployment. The budget for this first stage of development is $8,658. Phase II of this project (CB-RMM) will involve extending the DSA-XM to retrieve data from the DSS. The budget for the second stage of the project ($41,342) is pending available funding.

Legacy Project

Collection of digital and paper copies of drawings and schematics continued. Fourteen legacy documents summarizing tools, tool strings, and software packages developed and employed by ODP Logging Services have been completed to date and several others are under development. User manuals for the TAP and DSA tools are being updated, as well as the operations handbook for Logging Staff Scientists.

RAB Coring Project

This project is a joint effort among ODP Logging Services, Schlumberger, and Texas A&M to provide limited coring capabilities during RAB tool deployments. Recent advances in battery technology have provided an opportunity to reformat the internal design for an 8-inch RAB tool. By placing reduced size batteries in the drill collar wall, a small diameter core barrel can pass through the RAB, and thus allow limited coring while making geophysical logging measurements. Schlumberger is redesigning the RAB tool. TAMU is providing the MDCB coring apparatus. The effort is one component of the DOE Gas Hydrate program that was awarded to JOI (F. Rack) for Leg 204 and other ODP activities. Tool design and assembly are on schedule and field testing is scheduled for June 14 at the Schlumberger test facilities in Texas.

High Resolution Depth Counter
The new depth counter was installed and tested on the drillship in San Diego during the Leg 201 port call. The system is working as designed and should improve the depth resolution of high-resolution logging tools, such as the Multisensor Gamma Tool (MGT).

HYACE/HYACINTH
The DSA was successfully run with the Fugro Pressure Core sampler (FPC) on each of the seven pressure core deployments during Leg 201. The data acquired by the DSA was initially processed by shipboard personnel and has since been delivered to Fugro engineers in the Netherlands for characterization of the FPC drilling performance. The DSA worked flawlessly with the FPC and the data will be used to improve the FPC design. The FPC and DSA will be deployed on Leg 204 and the results compared with those from Leg 201.

TAP Tool Replacement
Machining of parts to replace the TAP tool lost on Leg 194 has been completed. PC boards, primary sensors have been purchased and assembled. Anticipated completion date for the TAP tool replacement project is Q3 FY 02.

III. SHIPBOARD LOG ANALYSIS

CLIP (Splicer/Sagan)
ODP Logging Services personnel have successfully demonstrated the use of Splicer and Sagan over a Unix network using a Mac OS X workstation with an X-windows emulator. Instructions for running the software in this configuration are available on the CLIP web page (http://www.ldeo.columbia.edu/BRG/ODP/ODP/CLIP/clip.html). This will allow users who have access to a Unix network but do not have a Unix workstation, to make use of CLIP software from their desktop.

IV. SHOREBASED LOG ANALYSIS

The following holes were processed and prepared for inclusion in the database:

ODP Conventional Date
Leg 201 - Holes 1225A, 1226B, 1228A, 1229A, 1230A

FMS Processing
Leg 199 – Holes 1218A, 1219A
Leg 200 – Hole 1224F
Leg 201 - Hole 1230A

Temperature Processing
Leg 195 – Hole 1201D

Training and Visitors
André Rousseau (Université Bordeaux – France) visited Aachen to discuss sonic logs in basement sections.

V. DATABASE

The ODP Log Database has been updated through Leg 201 including Schlumberger original and processed data (conventional, geochemical, and FMS), specialty tools (borehole televiewer, multi-channel sonic, and temperature), borehole images, and sonic waveforms.

Historical Data Migration
The review of all ODP proprietary data transferred to Unix was completed in January. The table of contents and complete inventory were also prepared.

Detailed documentation was prepared to accompany backup tar tapes of processed data currently available online through the ODP Logging website. These processed data files will data be sent to NGDC for archiving.

Post Cruise Distribution of Log Data
The Leg 193 and 194 Data CDs have been completed and duplicated. The Leg 196 Data CD was completed and sent out for duplication in early May.

Appendix I

Draft ODP/ISAS Digital Seismic Submission Guidelines

Purpose

Provide guidelines for the formatting of digital seismic data being submitted to the ODP and ISAS Data Bank.

Overview

The standard format for transferring digital seismic data is SEG-Y. However, there are many "flavors" of this standard, which can lead to difficulties when loading the data into seismic workstation software. Most problems are caused by the lack of documentation as to what choices were made in creating the SEG-Y file. The goal of these guidelines is to narrow the variety of SEG-Y files, which are received at the Data Bank, as well as to improve the documentation of those files. This will allow quicker data loading, better quality control, and proper documentation for subsequent users of the data.

Quality and Processing Levels

The Data Bank is not a processing facility and will not accept raw seismic data. The minimum level of processing accepted is that of filtered and stacked data. The data bank will accept time and depth migrated data.

Disk/Tape Formats and Media

SEG-Y data will be accepted on Exabtye tape, CD-ROM or DVD-ROM. Data can also be accepted via FTP through prior arrangement with the Data Bank staff. It is preferred that data be stored as SEG-Y files rather than SEG-Y tapes.

Navigation Issues

The Data Bank strongly urges the use of either Latitude/Longitude or UTM coordinates when providing location information. In any event, it is vital that the scale and projection of the location data be documented so that the data can be loaded with the proper geographic referencing. Note whether the navigation information is in a separate file, or if it is in the trace headers. If navigation is in a separate file, line numbers must be included and all columns should be constant width.

File/Tape Header Documentation Required

Ideally, all pertinent data regarding the SEG-Y file is contained in the File/Tape header, but this is often omitted. For this reason it is required that a completed 2D documentation sheet accompany each 2D seismic file being submitted, and a 3D documentation sheet be submitted for each 3D survey being submitted. This will ensure that all required information is available to the data loader regardless of the completeness of the header information.

Trace Header Documentation Required

The trace headers should contain the location coordinates, line number, shotpoint number and CDP (or crossline number for 3D). There are standard byte locations within the trace header for each of these numbers and they should be used when possible. The actual byte locations used in each SEG-Y file should be documented in the 2D or 3D documentation sheets that are submitted. Shotpoint and CDP numbers should increase or decrease monotonically within a given SEG-Y file. If shotpoint and CDP numbers do start over at zero, then each line should be saved in an individual SEG-Y file.

There is a record size limit of 64,000 bytes in IESX and there must be a constant number of samples per trace, and a constant sampling interval.

Seismic Data Projects

Upon receipt, SEG-Y data is loaded into an IESX project along with site locations for the drilling proposal. These data are used by various JOIDES panels to assist in the review of these proposals. If a proposal is scheduled as a Leg, the IESX project for that proposal is duplicated and sent to the ship when the Leg sails. Data may be added to the project file at sea as new seismic data are acquired, synthetic seismograms are developed, logging data are integrated, and seismic interpretations are made. The end-of-cruise project files are returned to the Data Bank and stored for future reference. Scientists who are developing proposals at or near previous drilling locations should check with the Data Bank Manager to see if project files are available for reuse.

ODP Digital Seismic Data Documentation Sheet –2D Seismic

General Information

Submitted for Proposal/Leg		Submitted By	
Date Submitted		Proprietary Release Date	

Coordinate System (pick one)

UTM

Zone	Central Meridian	Ellipsoid	
False Northing	False Easting	☐ Northern Hemisphere	☐ Southern Hemisphere

Latitude/Longitude

Northern Bound	Southern Bound	Eastern Bound	Western Bound

Shotpoint Information

Survey Name		
Min. Shotpoint	Max. Shotpoint	Traces/SP

Coordinate Information

In Trace Headers	In File	Path and Filename

Trace Header Information

Path and Filename			
☐ Tape	☐ Disk	Data Type	Trace Format
Seismic Datum Elevation	Seismic Datum Velocity	Start Time	End Time
Shotpoint Byte Address	Shotpoint Scale Factor	Shotpoint Byte Format	
X Byte Address	X Scale Factor	X Byte Format	
Y Byte Address	Y Scale Factor	Y Byte Format	
CDP Byte Address	CDP Format	Range	
Storage Format ☐ 8 bit ☐ 32 bit			

Comments

ODP Digital Seismic Data Documentation Sheet –3D Seismic

General Information

Submitted for Proposal/Leg		Submitted By	
Date Submitted		Proprietary Release Date	

Coordinate System (pick one)

UTM

Zone	Central Meridian	Ellipsoid	
False Northing	False Easting	☐ Northern Hemisphere	☐ Southern Hemisphere

Latitude/Longitude

Northern Bound	Southern Bound	Eastern Bound	Western Bound

Survey Information

Survey Name			
Min. Inline Num	Max. Inline Num	Line Increment	Line Bin Spacing
Min. X-line Num	Max. X-line Num	X-line Increment	X-line Bin Spacing

Define Corners of Survey Grid

Corner 1	Line Num	X-line Num	X or Lon	Y or Lat
Corner 2	Line Num	X-line Num	X or Lon	Y or Lat
Corner 3	Line Num	X-line Num	X or Lon	Y or Lat
Corner 4	Line Num	X-line Num	X or Lon	Y or Lat

Trace Header Information

Path and Filename			
☐ Tape	☐ Disk	Data Type	Trace Format
Seismic Datum Elevation	Seismic Datum Velocity	Start Time	End Time
Line Byte Address	Line Byte Format	X-line Byte Address	X-line Byte Format
Sample Rate	Samples/Trace	Start Time	End Time
X Byte Address	X Scale Factor	X Byte Format	
Y Byte Address	Y Scale Factor	Y Byte Format	
CDP Byte Address	CDP Format	Range	
Storage Format ☐ 8 bit ☐ 32 bit			

Comments
