

Field Support for Long-Coring on the New Jersey Margin

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LONG-TERM GOALS

The long-term goal of this project is to provide a detailed understanding of the stratigraphic significance of buried geologic structure on the New Jersey shelf and the interaction of buried geologic structures with acoustic energy from tactical sonars. A second goal is to test and establish tools and techniques for providing affordable long coring capability to the marine geosciences community. A final goal is to provide groundtruth for the high-quality Chirp records from the New Jersey natural laboratory, which is critical for achieving the goals of the Geoclutter and Strataform programs, as groundtruth provides the bridge between physical stratigraphic observations, seabed geotechnical properties and acoustic response and seismic interpretations of depositional processes.

OBJECTIVES

The objectives of this work unit are twofold: 1) plan, mobilize for and carry out a cruise to collect cores from the New Jersey shelf to ground-truth the geophysical data from the Geoclutter are, using the AHC-800 coring system which has been proven to collect high-quality cores in this environment; and 2) to disseminate information concerning the utility of the AHC-800 system to the geosciences community.

WORK COMPLETED

1) Collection of Precision-Located Cores from the New Jersey margin.

The DOSECC AHC-800 coring system has been tested in November 2001 and proven to work in the New Jersey Natural Laboratory. I have jointly planned, coordinated and carried out a 3-week sample collection cruise with J. Austin, using the AHC-800 in September-October 2002. The NAVY supported this cruise as part of the GEOCLUTTER Initiative. J. Austin and I were co-chief Scientists, with my primary responsibility being for cruise logistics, the sample collection effort and subsequent sedimentological and radiometric analyses of core material.

Pre-cruise preparations required the mobilization of 19 science party members from a variety of institutions (SkIO, UTIG, UDel, USGS, GSU, U Laval) and 10 DOSECC drilling party members, acquisition of a MST logger and core splitter and purchase of specific core-handling and archiving supplies. The cruise effort was successful and produced a working knowledge of high-precision station keeping, intact sample collection with the AHC-800 and sample handling after collection. During this cruise, we collected three long cores from Geoclutter areas 1 and 2, ranging in length from 6 to 13 m

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that were logged at sea with a MST logger, split, described and subsampled for radiocarbon analysis. Samples from all core catchers were retained for a “quick-look” at the foraminiferal assemblages and mineralogical composition of the cored sediments. A detailed cruise report was delivered to ONR following the cruise and is available from either of the Chief Scientists. The table below summarizes pertinent details of the cores collected during the ~7 days of coring time we had after weather and equipment delays (both ship- and coring-gear-related) were accounted for.

Figure 1: Core Summary for AHC-800 Coring (HPC - hydraulic piston core, XN - extended nose push core).

New Jersey 2002 Summary Statistics

Site	Hole / Tool	Water Depth (m)	Number of cores	Interval Cored (m)	Interval Recovered (m)	Recovery (%)	Penetration (m)
1	A/HPC	127	2	5.1	4.6	89.9	5.1
	B/XN	127	2	5.8	2.7	45.9	5.8
	C/XN	127	2	6.7	3.2	48.3	6.7
2	C/HPC	79	1	1.1	1.0	85.0	1.1
	H/HPC	79	1	2.6	2.6	100	4.5
	I/HPC	79	1	2.1	2.1	100	6.6
	J/HPC	79	5	6.8	6.7	98.7	13.1
3	A/XN	75	1	2.0	0.9	43.9	2.0
	B/XN	75	4	6.2	6.2	100	7.8

These cores are the longest high-quality cores collected from this part of the margin and represent a unique sample set to provide temporal, stratigraphic and environmental context for seismic stratigraphic interpretation and future sampling efforts. The cores have been archived at the Lamont ODP repository, integrated into the ODP database and have been subsampled extensively for detailed analysis of time stratigraphy, sediment texture and depositional environment. The analysis of 320 textural samples, 112 biostratigraphic samples and 20 magnetostratigraphy samples are currently underway. The currently available radiocarbon age control and biostratigraphic depositional environment results are reported in a companion annual report for the project “Temporal Framework

and Sediment Characterization of Long Cores from the New Jersey Shelf in Support of the GEOCLUTTER Initiative”.

2) Communication of Field Results

Over the past year, I have given two invited talks highlighting our results and experience with the AHC-800 on the RV KNORR.

1) Update on Shallow Water Drilling Technology – invited presentation at NSF MARGINS focus site planning meeting, Gisborne, NZ, May 2003

2) Heave-Compensated Drilling on the New Jersey Continental Shelf – invited presentation at the DOSECC Annual Meeting, Minneapolis, MN, June 2003

The communication and integration of results within interdisciplinary research programs is critical to gain the highest return from the time and money invested. I am working closely with Austin, Goff, Fulthorpe, Christensen and Sommerfield to integrate our datasets as they are developed. As new data is produced in this project, I input the information into ARCVIEW so that it can be distributed and used in a GIS database format.

IMPACT/APPLICATIONS

The full impact/applications of these results are yet to be determined. The core collected will provide a wealth of material from which to produce acoustic models the seabed. Physical property measurements from the MST logger, textural data, age control and biostratigraphy will contribute to a better understanding of buried stratigraphic surfaces, their relationship to geologic processes active during past geologic periods and to a better predictive capability for buried structure/geoclutter on margins that are less well known.

TRANSITIONS

None at this time.

RELATED PROJECTS

Austin, Goff, Fulthorpe, Sommerfield and Christensen have complementary ONR Geoclutter funding to participate in the analysis of the KNORR cores and I am in close collaboration with all these researchers. Austin, other UTIG PIs and a doctoral student are examining the high-resolution Chirp data from the shelf and interpreting the acoustic stratigraphy observed. Sommerfield is investigating surficial and subsurface physical properties of the NJ sediments. Christensen is characterizing the depositional environments represented by recovered sediments. H. Lee and J. Locat have a strong interest in the physical property data we produce and will use them to better constrain geotechnical properties of the upper few meters of the seabed. They both sent participants on the cruise as an indication of their interest.

REFERENCES

none

PUBLICATIONS

The following publication incorporated unpublished Strataform data and heavily referenced publications from the Strataform program:

Alexander, C.R. and C. Venherm. 2003. Modern sedimentary processes in the Santa Monica, California continental margin: sediment accumulation, mixing and budget. *Marine Environmental Research*, 56:177-204.

In addition, I have contributed text, data and figures to two Master volume chapters (3 and 4).

Abstracts of Current Results

Clark Alexander, Christopher Sommerfield, James Austin, Beth Christensen, Craig Fulthorpe, John Goff, Sean Gulick, Sylvia Nordfjord, Dennis Nielson, Steven Schock. Sedimentology and Age control of late Quaternary New Jersey Shelf deposits. AGU Fall 2003 Meeting, San Francisco, CA.

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Craig S. Fulthorpe, John A. Goff, James A. Austin, Jr., Sean P.S. Gulick, Sylvia Nordfjord, Clark Alexander, Christopher Summerfield, Beth Christiansen, Steven Schock, Dennis L. Nielson. Enigmatic Shallow Subsurface Stratigraphy on the New Jersey Mid-Outer Shelf: Catastrophic Erosion or Diagenesis? AGU Fall 2003 Meeting, San Francisco, CA.

Sean P.S. Gulick, Craig S. Fulthorpe, John A. Goff, James A. Austin, Sylvia Nordfjord, Christopher Summerfield, Jr., Clark Alexander, Beth Christiansen, Steven Schock, Dennis L. Nielson. Mapping a Pre-Last Glacial Maximum Paleo-Sea-floor and Shelf-Slope Sediment Wedges beneath the New Jersey shelf. AGU Fall 2003 Meeting, San Francisco, CA.

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Sylvia Nordfjord, John A. Goff, James A. Austin, Craig S. Fulthorpe, Sean P.S. Gulick, Christopher Summerfield, Jr., Clark Alexander, Beth Christiansen, Steven Schock, Dennis L. Nielson. Geomorphologic comparisons of shallowly buried, dendritic drainage systems imaged on the outer New Jersey shelf with modern records of both fluvial and tidal influences. AGU Fall 2003 Meeting, San Francisco, CA.

Christensen, B. A. and Alexander, C. R. Pleistocene and Recent depositional environments of the New Jersey margin: Preliminary results from long coring. 2002 SE GSA Annual Meeting.

Christensen, B. A., Goff, J., Alexander, C. R., Austin, J. A., Fulthorpe, C., Gulick, S., Nordfjord, S., Sommerfield, C., Venherm, C., and Walsh, D. A comparison of Pleistocene and Recent depositional environments on the NJ Continental shelf. 2003 Annual Meeting, American Association of Applied Palynologists.

C. Alexander and J. A. Austin, Jr. Cruise Report – KN167-KN168A/B: “AHC-800 Coring on the New Jersey Shelf for ONR’s Geoclutter Initiative”, *R/V KNORR*, 27 September – 17 October 2002.

PATENTS

none