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U.S. GEOLOGICAL SURVEY
BRANCH OF ATLANTIC MARINE GEOLOGY
MEMORANDUM
21 May 1985

To: Distribution

From: Jim Robb, Dave Twichell Jim Robb Dave Twichell

Subject: Cruise Report

39 N
72.30' E
73° W
38.46 S

Ship: U. S. Navy Nuclear Research Submersible NR-1

Cruise Number: none

Dates/Ports: 8-16 May 1985,
Depart and Return port:
Submarine Base New London (Groton, CT)

Personnel: USGS Observers: J. Robb, D. Twichell
OIC NR-1: LCDR James Holloway

Purpose: Observation and sampling of the upper continental slope, between Lindenkohl and South Toms Canyons, offshore New Jersey.

Equipment Used: Navy furnished Edo-Western 7 kHz subbottom profiler, Westinghouse 100-kHz sidescan sonar, video and photography systems. USGS-furnished corer assembly, for use with NR-1's manipulator arm.

Navigation: A very precise bottom-doppler system provided relative navigation on bottom. Geodetic location by occasional acoustic ranging from ASR Sunbird on the surface. Sunbird used Loran C and Transit satellite.

Data acquired:

7 kHz profiles:	about 55 track-nmiles (102 km)
Sidescan-sonar images	about 55 track-nmiles (102 km)
video tapes	26 VHS cassettes
Benthos-camera film (35 mm)	about 400 ft
70-mm film	about 150 ft
Hand-held (Topcon 35 mm) camera film rolls	3
Digital-data, 9T magnetic tapes (navigation plus current and water data)	3 reels
Sediment cores (12-inch corers)	10 recovered

Narrative:

NR-1 departed dockside at the Submarine Base New London about 1600 8 May 1985, to be towed on surface by ASR Sunbird to

200 fm curve south of Long Island. There NR-1 submerged (0645, 9 May), and tow continued to the work area near the head of Lindenkohl Canyon, where tow was released (1405, 9 May), and submerged observations commenced. NR-1 remained submerged, near or on the bottom on the upper continental slope between Lindenkohl and South Toms Canyons, until surfacing at 1350, 15 May, when ASR Sunbird commenced towing the submarine for return transit. NR-1 docked at the Submarine Base New London about 1430, 16 May 1985.

We operated the subbottom profiler and sidescan sonar nearly the whole period in the study area except when very near bottom for visual observations. These instruments provided very good, high resolution data. When targets were located the excellent bottom-doppler navigation system of the submarine was used to position the ship for direct bottom observation through the viewports. Unfortunately, turbidity was high; visual observations of geologic characteristics required that the submarine be less than about 10 feet above bottom, and speed had to be quite slow. On-bottom operation, using the submarine's wheels, was not possible because slopes were too great and turbidity from any disturbance of the muddy bottom would prevent visual observation.

Observations were made in the upper parts (to about 2250 ft) of Lindenkohl, Carteret, Berkeley, and South Toms Canyons, as well as transects of intercanyon areas. More detailed surveys were made of 6 areas where slumping or outcropping strata were anticipated, based on previous surface-towed profiles or Sea-MARC images.

Preliminary scientific evaluation:

Our preliminary impression, before extensive post-cruise review of our data and observations, is that the upper continental slope in this area is inactive or is receiving slow deposition from the apparently ubiquitous nepheloid layer. Erosion or mass-wasting is minimal. Our remotely sensed, but very high-resolution data, and direct observations of the sea bottom can be construed as unsupportive of some published accounts that assert active upper-continental-slope conditions.

No evidence of current activity was observed in the bottom sediment surface. The bottom surface in canyon axes appeared the same as in intercanyon areas. Subbottom profiles show a nearly transparent, homogeneous layer generally 2 to 8 meters thick overlying an erosional unconformity. The homogeneous layer was thicker in canyon floors (perhaps 20 m or greater). Sidescan-sonar (100 kHz at 100 m range) showed endless expanses of featureless surface. In the places where topographic features such as scarps or slope changes were observed on the sidescan records, direct visual observations generally revealed uniform, apparently fine-grained bottom sediment, with moderate biotic activity of crabs, fish, and worms. Benthic activity probably puts significant amounts of sediment in suspension,

contributing to downslope transport. Bottom irregularities were on the scale of centimeters. No outcrops were found during this operation, except at the site of one slump previously located on Sea-MARC data, where blocky rubble dusted with fine-grained sediment was observed. Observations at places where subbottom profiler data indicated possible outcrops of the underlying Pleistocene strata showed a uniform, apparently smooth bottom, although in some places anemones (Venus flytrap or other large forms) or greater densities of burrows indicated the possible presence of a harder substrate. Core samples remain to be analyzed.

In one place we located several hundred 20- to 50-gal drums and other packages on the bottom that were clearly distributed along a single track, presumably as dumped from a passing ship. These were observed on the sidescan-sonar records and then visually observed and photographed. Their precise nature or contents were not determined.

The 24-hour capability to operate subbottom profiler and sidescan sonar devices that provided very high-resolution, near-bottom data, coupled with the NR-1's ability to relocate and to observe remotely sensed targets visually, allowed excellent coverage of the study area during this operation.

We very much appreciate the cooperation of the U. S. Navy, and the extensive, friendly cooperation and assistance provided us by LCDR Holloway and the officers and crew of Submarine NR-1 during this project.

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