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Mid-range sidescan-sonar data from the Continental Slope off Georges Bank, between Lydonia and Oceanographer Canyons

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The geology of the Continental Slope off Georges Bank is presently being investigated because of the region´s petroleum resource potential. The U.S. Geological Survey (USGS), in cooperation with the U.S. Bureau of Land Management, is conducting studies to identify geological conditions and/or processes that constitute potential hazards to engineering and consequently to the environmental integrity of the slope - for example, mass movement phenomena, shallow faults, and unstable surficial sediment. Because such features are not adequately delineated by conventional acoustic and bottom sampling techniques, sonar imaging was undertaken to provide the quasi-synoptic rendition of the slope terrain needed to recognize or better interpret them.

The part of the Continental Slope that includes Lydonia and Oceanographer Canyons (fig. 1) was chosen for mid-range sidescan-sonar imaging because it is an area of deep, complex erosion seaward of the area of greatest present interest for exploration, for which extensive previously obtained correlative data are available. An area of about 2,800 km^2 was surveyed between longs. 67°30´W and 68°15´W in water depths between 500 m and 2,400 m (fig. 1). Five parallel tracks were run along the slope. The shallowest track defines an image swath 2.5 km wide; the deeper four tracks define swaths 5 km wide.

The sidescan-sonar data were acquired during R.V. GYRE cruise 80-G-8 from August 29 to September 2, 1980. The sonar system used was the International Submarine Technology, Ltd. (IST), Sea MARC (Mapping And Remote Characterization) I, owned and operated by Lamont-Doherty Geological Observatory.

The Sea MARC fish is a neutrally bouyant vehicle tethered to a one-ton depressor and towed approximately 300 m off the bottom at all times; it produces a "draped" survey. In order to track the fish position and maintain proper elevation, a 4.5-kHz fish-mounted echo sounder provided continuous bottom profile record and ship-to-fish range. Ship speed was nominally 2 kn.

Sea MARC emits 1.7° horizontal beams at frequencies of 27 kHz and 30 kHz with a bandwidth of 5 kHz. Beam depression angle is relatively large so a back-scatter component from surface roughness is important in the images. Sea MARC has a dynamic range of 255 db, but because the electrostatic paper recorders used for analog display have only a 16-db range, signal returns were automatically classified according to 16 equal interval density classes.

A slant-range correction to horizontal range was automatically performed. Each array of 1,024 pixels per side was collected during each 4-sec sweep, then printed according to proper machine-calibrated range correction. One set of images is "linearized" or made nearly isometric by keeping range and azimuth distances nearly equal on the images during recording. Spatial distortion along track was mainly controlled by manually adjusting recorder chart speed to ship speed.

Navigation was obtained by 5-minute Loran-C fixes supplemented with satellite fixes. All recorded times were synchronized with GMT (Greenwich Mean Time).

The data include the following items:

1. Raw sidescan images: port and starboard, 4-sec sweep. Data include both look directions (port and starboard) along track with time annotated along trackline every 30 minutes. Tracklines are numbered at beginning and end of each line. On line 1, port is the upslope direction. Dark tones represent acoustic reflections; white represents acoustic shadow.

2. Raw sidescan images: port. Same as above, port look direction only (2.5-km range except shallowest line (line 1) is 1.25 km). Time annotated along trackline every 15 minutes.

3. Raw sidescan images: starboard. Same as above, starboard look direction.

4. Slant-range corrected sidescan images: port and starboard. Data include both look directions along track with time annotated along trackline every 15 minutes. Far-range truncated on each side because of slant-range correction procedure. Grid lines along track represent 250-m spacing.

5. Slant-range corrected "linearized" sidescan images. Same as above except images are nearly isometric. Line 1 images marred because of machine problems.

6. Ship's 3.5-kHz bottom profiles and sonar fish 4.5-kHz bottom profile: Each recorded simultaneously on 2-channel recorder. Time annotated every 15 minutes; 4.5 kHz operated on 1-sec sweep; 3.5 kHz operated on 1-4-sec sweep. Numerous multiples and range echoes shown in line 1.

7. Ship's 3.5-kHz bottom profile. Time annotated every 15 minutes; 1-4 sec sweep. Numerous multiples and 4.5-kHz signals shown in line 1; 4.5-kHz fish-to-ship range signal shown on each line.

Original records and ancillary data may be viewed at the USGS office in Woods Hole, Mass. Microfilm or paper copies of the described data, including the track chart, can be purchased only from the National Geophysical and Solar Terrestrial Data Center, NOAA/EDIS/NGSDC, Code D621, 325 Broadway, Boulder, Colo. 80303.

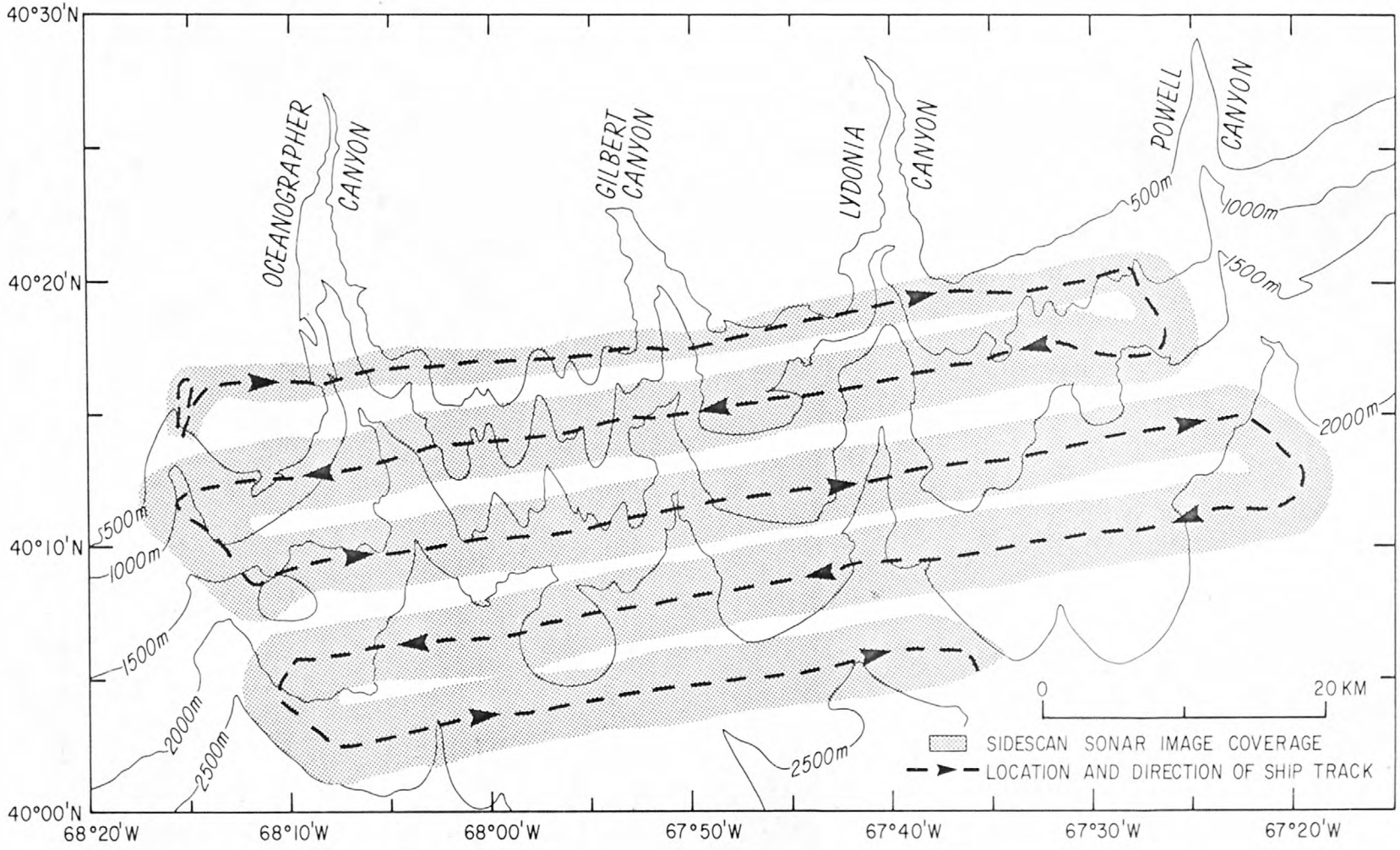

Figure 1. Map showing location of mid-range sidescan-sonar tracklines, GYRE 80-G-8. Lines numbered one to five from top (shallowest) to bottom (deepest).