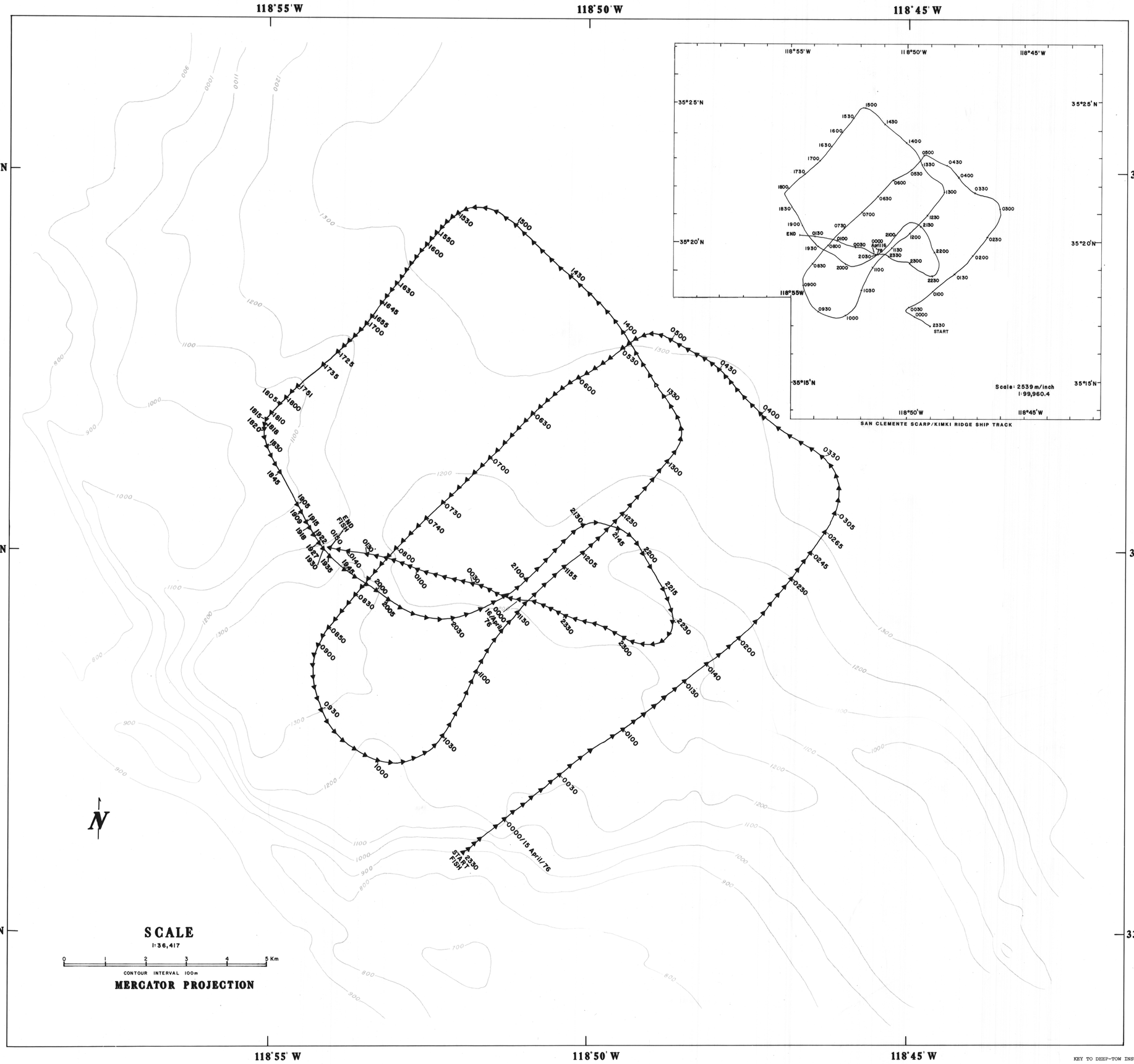
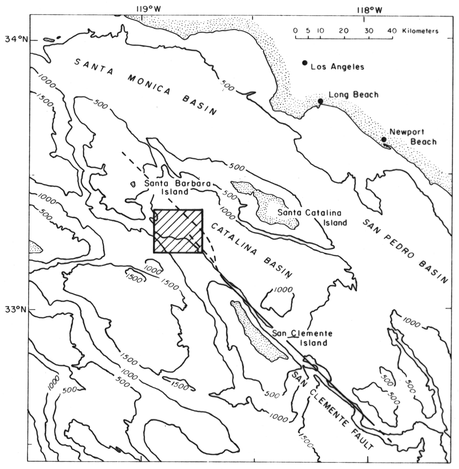
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN FILE REPORT
80-932
SHEET 1 OF 2



TRACKLINES FROM DEEP-TOW VEHICLE

LOCATION MAP



EXPLANATION

A detailed geophysical study of a short segment of the San Clemente fault northwest of San Clemente Island was conducted in April 1976 using the R/V Melville of the Scripps Institution of Oceanography (SIO). The survey utilized the deep-tow vehicle developed at the Marine Physical Laboratory at SIO under the direction of F. N. Spiess (Spiess and others, 1978). A Miniranger radio-transponder navigation system was used to provide ship positions every five minutes. The position of the deep-tow vehicle is usually fixed in relation to acoustic transponders placed on the seafloor, but in this survey bottom-anchored acoustic transponders were not available. A computer model of the towing operation, the TOAD program, was used to predict the position of the deep-tow vehicle. The program calculates the gross motions of the towing cable and vehicle during ship maneuvers, using the ship's position, the weight of the deep-tow, and the weight and length of the cable. The TOAD program positions are probably accurate to within 50-100 m or better, except in short radius corners (Ivers and Mudie, 1973).

The deep-tow instrument package includes the precision echo-sounding and 4.0-kHz high resolution seismic-reflection and side-scanning sonar systems used in this survey, as well as photographic and physical oceanographic sensors and water samplers (Spiess and others, 1978). The ship's 12-kHz echo sounder provided local bathymetric control during deep-tow operations. All data presented in this open file report are analog displays produced on conventional echo-sounding recorders. These data include:

(1) Precision echo-sounding using a narrow-beam downward-looking 125-kHz sonar and a wide-beam upward-looking 23-kHz sonar. The water depth trace is created from the sum of these two ranges. All three traces appear on the record, and the record width is one second of round trip travel; (2) left channel and (3) right channel of the side-scanning sonar system, both operated at 110-kHz and recorded separately at a one second sweep rate; (4) 4.0-kHz seismic reflection system is recorded at a one half second sweep; the subbottom profile on the record is roughly paralled by the trace of the outgoing pulse and by the trace of the up-looking sonar returns; (5) digitally processed 4.0-kHz seismic data, displayed in analog form showing only the uppermost 60 meters below the seafloor. The upper half of the record can be used to compare reflectivity amplitudes and the lower half displays the reflection data with seafloor relief removed; for details of record interpretation and processing techniques see Tyce (1976, 1977); (6) standard 12-kHz, wide-angle echo-sounding profile from the surface ship, recorded at a one-second sweep.

Ivers, W. E. and Mudie, J. D., 1973, Towing a long cable at slow speeds: A three-dimensional dynamic model: In: Marine Technology Society Journal, v. 7, no. 3, p. 23-31.

Spiess, F. N., Lowenstein, C. D., Boegeman, D. E., and Mudie, J. D., 1976, Fine-scale mapping near the deep-sea floor: Marine Technology Society, Institute of Electrical and Electronic Engineers, Annual Meeting, Proceedings - Oceans '76, p. 8A-1 - 8A-9.

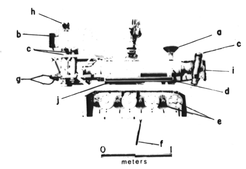
Tyce, R. C., 1976, Near bottom observations of 4-kHz acoustic reflectivity and attentuation: Geophysics, v. 41, p. 673-699.

Tyce, R. C., 1977, Toward a quantative near-bottom seismic profiler: Ocean Engineering, v. 4, p. 113-140.

DEEP-TOW INSTRUMENT

KEY TO DEEP-TOW INSTRUMENTS

a - Upward-looking echo sounder
b - Navigation transponder
c - Cameras
d - Side-scanning sonar
e - Water sampler bottles
f - Cable to strobe for cameras
g - Cable to 4.0-kHz reflection profiling receiver
h - Emergency pinger
i - Forward-looking obstacle-avoidance hydrophone
j - Conductivity, temperature, depth sensors



TRACKLINE MAP AND ACOUSTIC PROFILES SHOWING DEEP-TOW GEOPHYSICAL DATA FROM THE NORTHERN SEGMENT OF THE SAN CLEMENTE FAULT, CALIFORNIA BORDERLAND

BY

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1980

This report is preliminary and has not been reviewed for conformity with U.S.Geological Survey editorial standards. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S.G.S.

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