

truncatulinoidea, and *G. inflata*, in ancient Californian sediments should lead to a better understanding of paleobasin oceanography by making it possible to determine sill depths and oxygen minimum distributions. Such studies have obvious applications in the determination of petroleum source rocks, because organic material is preserved in anaerobic conditions but destroyed in aerated sediments.

FRED A. AVILA, Pan American Petroleum Corp., Denver, Colo.

MIDDLE TERTIARY STRATIGRAPHY OF SANTA ROSA ISLAND, CALIFORNIA
(No abstract submitted)

DAVID DOERNER, Dept. of Geology, Univ. of California, Santa Barbara, Calif.

PALEOGENE SEQUENCE IN NORTHERN CHANNEL ISLANDS, CALIFORNIA

Cretaceous and/or lower Tertiary marine sedimentary rocks crop out on the three major northern Channel Islands. Study of the rocks and their contained foraminiferal assemblages reveals many faunal and lithologic similarities between these three islands.

On Santa Cruz Island foraminiferal assemblages indicate that deposition of Cretaceous and Paleocene strata took place in a shallow-water marine basin which became continuously deeper during Eocene time until lower bathyal depths were present by the end of late Eocene time. Sedimentary structures and textures, as well as lateral thickening of strata, suggest source areas on the north or northeast.

On Santa Rosa Island, where the oldest rocks exposed are of middle and late Eocene ages, foraminiferal assemblages indicate a similar deepening.

On the west, however, foraminifers from Cretaceous and early Tertiary strata of San Miguel Island indicate continuous deep-water conditions and open-ocean circulation during Cretaceous, Paleocene, and Eocene times.

The writer suggests that all three depositional sites were part of a single basin or two closely contiguous basins with a northwest-southeast axial trend.

S. ROBERT BERESKIN, Dept. of Geology, Univ. of California, Santa Barbara, Calif.

MIOCENE BIOSTRATIGRAPHY OF SOUTHWESTERN SANTA CRUZ ISLAND, CALIFORNIA

A 2,265-ft conformable sequence of marine conglomerate, sandstone, and mudstone crops out along continuous sea-cliff exposures on southwestern Santa Cruz Island. Disconformably overlying rocks of late Eocene age, the Vaqueros Sandstone, the Rincon Formation, the San Onofre Breccia, and the Monterey Formation contain mollusks and foraminifers, which indicate the presence of a Miocene sequence of Zemorrian through Mohnian(?) ages.

The southwestern corner of the island is structurally represented by a doubly plunging anticline trending approximately N40°W. Outcrops of the Vaqueros, Rincon, and San Onofre formations are on both the southwestern and northeastern limbs of the fold enveloping a Paleocene-Eocene core. The Monterey Formation is exposed only on the southwestern limb and, although this unit is not lithologically identical to the

typically siliceous Monterey Formation on the mainland, it can be correlated with these mainland exposures on the basis of fossil Foraminifera. Paleoeologic and paleotopographic studies based on field relations and foraminiferal paleoecology indicate that the shallow part of the basin was on the east or northeast, and that the deeper areas extended westward and perhaps southward.

SEG TECHNICAL PROGRAM SUMMARY

THURSDAY AFTERNOON, MARCH 27

1. R. L. MAXWELL, P. A. GAECHTER: Geophysical survey application of Doppler sonar navigation
2. G. B. MORRIS, R. W. RAITT, G. G. SHOR, JR.: Velocity anisotropy of upper mantle
3. THANE H. McCULLOCH: Oil fields, gravity anomalies, and surface chemical manifestations—correlations, causes, and exploration significance
4. JOHN K. ALDRICH: Gravity of northern Channel Islands
5. E. BERKMAN, I. R. LAFEHR: Bouguer reduction technique for surface ship gravity meter data

FRIDAY MORNING, MARCH 28

1. M. D. CARTER AND OTHERS: Applications of continuous reflection parameter selection
2. J. M. HORNSBY: Seismic record section at depth
3. C. H. DIX: Searching for stratigraphic traps
4. MILTON DOBRIN: (Title to be announced)

FRIDAY AFTERNOON, MARCH 28

5. H. GARY GREENE: A portable refraction-seismography survey of gold placer areas near Nome, Alaska
6. RICHARD TAGG: (Title to be announced)
7. W. E. BALES, L. D. KULM: Structure of continental shelf off southern Oregon
8. L. D. KULM, W. E. BALES: Shallow structure and sedimentation on upper continental slope off southern and central Oregon
9. LEE C. BENNETT, JR.: Continuous seismic profiling on continental shelf off Washington

ABSTRACTS OF PAPERS

(in order of presentation)

ROBERT L. MAXWELL and P. A. GAECHTER, Marquardt Corp., Los Angeles, Calif.

GEOPHYSICAL SURVEY APPLICATION OF DOPPLER SONAR NAVIGATION SYSTEMS

Recent developments in Doppler sonar-velocity-measurement techniques have made available a new navigational aid for marine survey operations. This paper describes the capabilities of the Marquardt Doppler sonar system. A description of currently available equipment, a summary of its performance in the operational marine environment, and applications of this equipment to geophysical survey navigation also are presented.

G. B. MORRIS, R. W. RAITT, and G. G. SHOR, JR., Univ. of California, San Diego, and Marine Physical Laboratory of Scripps Institution of Oceanography, La Jolla, Calif.

VELOCITY ANISOTROPY OF UPPER MANTLE¹

During the summer of 1966 a joint marine refraction survey was conducted across the Hawaiian arch by the Scripps Institution of Oceanography, the University of Hawaii, Oregon State University, and the University of Wisconsin. Conventional and unique types of refraction profiles were shot to study the directional dependence of velocity or velocity anisotropy of the mantle and the depth configuration of the Mohorovičić discontinuity. A two-dimensional delay time function method was used to study (1) the anisotropy and (2) the delay-time surface. The upper mantle was found to display compressional velocity anisotropy amounting to about 0.6 km/sec difference between the maximum and minimum velocities with the direction of maximum velocity being east-west. The delay time surface suggests that, as expected from earlier work, the mantle is generally shallow along the crest of the arch. The shallowest region occurs near the southeast end of the arch, where it intersects the Molokai fracture zone. The mantle deepens southwest of the crest of the arch as the Hawaiian deep is approached.

THANE M. McCULLOH, U.S. Geol. Survey, Menlo Park, Calif.

OIL FIELDS, GRAVITY ANOMALIES, AND SURFACE CHEMICAL MANIFESTATIONS—CORRELATIONS, CAUSES, AND EXPLORATION SIGNIFICANCE
(No abstract submitted)

JOHN K. ALDRICH, Univ. of California, Santa Barbara, Calif.

GRAVITY OF NORTHERN CHANNEL ISLANDS

The northern Channel Islands form a regional gravity high which forms a break in the dominant northwest-southeast gravity pattern south of the islands and the east-west gravity and structural pattern found on the north in the Transverse Ranges province of California. Both northwest-southeast and east-west components are apparent in the gravity and structure on the islands. Thus, the northern Channel Islands lie on the border between Transverse Ranges structure and the northwest-trending structures characteristic of the rest of California.

The complete Bouguer anomaly values across the northern Channel Islands range from 20 to 80 mgal. North of the Santa Cruz Island fault there is little variation in the complete Bouguer anomaly except toward the east across the Anacapa Passage, where the complete Bouguer anomaly decreases sharply. This decrease reflects the deepening of the basement rock under the Santa Barbara Channel.

South of the Santa Cruz Island fault, a continuous gravity pattern extends from the schist exposures on Santa Cruz Island to Point Bennett on San Miguel Island. This continuity in gravity suggests that the basement rock and the Santa Rosa basin also are continuous from the southwestern part of Santa Cruz Island to the western tip of San Miguel Island. The lowest gravity values are found in the Santa Cruz Passage, a fact that indicates that the center of the Santa Rosa basin is between Santa Cruz and Santa Rosa Islands. This gravity low is an extension of the gravity low in the Santa Cruz basin on the south and suggests that the Santa Rosa basin is a northern continuation

of the Santa Cruz basin. A gravity high south of San Miguel Island and a high north of Santa Rosa Island give evidence for two possible preexisting source areas, which supplied sediments to the area of San Miguel and Santa Rosa Islands.

Sparker profiles in the Santa Cruz Passage show the presence of a northwest-trending fault along Santa Cruz Canyon, but the continuity of the gravity data across this region shows that this fault is unimportant. A second fault, the Santa Rosa Island fault, cannot be seen on the sparker profiles, nor is it reflected in the complete Bouguer anomaly values over Santa Rosa Island. Therefore, this fault also is insignificant in regional structure. The Santa Cruz Island fault, in contrast, is reflected markedly in the gravity pattern over the island, and may have produced a large amount of lateral offset.

E. BERKMAN, Mobil Oil Corp., Los Angeles, Calif., and T. R. LAFEHR, GAI, GMX, Houston, Tex.

BOUGUER REDUCTION TECHNIQUE FOR SURFACE SHIP GRAVITY METER DATA
(No abstract submitted)

MELVAN D. CARTER and OTHERS, Geophysical Service, Inc., Los Angeles, Calif.

APPLICATIONS OF CONTINUOUS REFLECTION PARAMETER DETERMINATION

This processing technique automatically extracts reflection information continuously in space and time from the CDP input data. The reflection parameters are obtained by a systematic search in time and moveout which yield an estimate of arrival time $T_r(X)$, amplitude $A_r(X)$, and moveout $\Delta T_r(X)$ for each depth point. The combination of all the reflector segments for the line forms a reflector segment file consisting of all coherent events reflected from the subsurface including primaries, multiples, diffractions, and "false alarms."

Variations in band width and the picking aperture of both time and moveout are investigated in this paper. Land and marine field data are used to illustrate the results.

JAMES M. HORNSBY, Western Geophysical Company, Los Angeles, Calif.

SEISMIC RECORD SECTION IN DEPTH

Automatic velocity-determination methods developed in recent years make it possible for the geophysicist to convert seismic information from time coordinates to depth coordinates. In making this conversion it is feasible to account for almost any horizontal velocity gradient and, under favorable conditions, to migrate the data and still have the results in the form of a record section. Although these procedures offer possibilities for saving labor and for improving interpretational insight, they should be used with the understanding that interpretation is involved and the results should be reviewed as new data are added.

C. H. DIX, California Inst. Technology, Pasadena, Calif.

SEARCHING FOR STRATIGRAPHIC TRAPS

The main difference between a great anticlinal or fault trap and a great *other* kind is that the former is

¹ Contribution of the Scripps Institution of Oceanography, new series.