

OCEANOGRAPHY SESSIONS

INFLUENCE OF SHIP DYNAMICS ON
SATELLITE NAVIGATION

O-2

Hal H. Bybee, Jr. and John M. Hughes

Pitch and roll is one possible source of error in an integrated marine navigation system. A theoretical analysis of the influence of pitch and roll on the four beam doppler sonar, gyrocompass, and Navy navigation satellite system receiver combination in an integrated marine navigation system is measured by single degree of freedom inclinometers. Typical sets of data from three different vessels are presented in both the time domain and the frequency domain so that the relationships predicted by the theoretical analysis may be observed. This information is related not only to the marine navigation problem, and the doppler sonar error attributable to a lack of pitch and roll knowledge, but also to the analysis of data from other sensors attached to the vessel. This analysis is also extended to evaluate the error introduced into individual satellite fixes in a nonintegrated system by the lack of knowledge of ship dynamics.

236
GEOHERMAL EXPLORATION IN
THE SALTON TROUGH, CALIFORNIA

M-26

Tsvi Meidav and R. W. Rex

Growing interest in local, nonpolluting sources of energy, coupled with the increasing attractiveness of geothermal energy for dual utilization of power and desalination, spurred this study of the potentialities for geothermal energy in the northern portion of the Salton Trough, California. A multipronged approach, using complementary geophysical techniques has been found to be optimal for the purpose.

Low-amplitude gravity anomalies have been found to be useful indicators of location of geothermal anomalies, apparently due to partial metamorphism of the sediments by rising plumes of hot water. Geothermal gradient measurements in 100-300 ft holes have been employed to delineate the anomalies. Inverse Schlumberger resistivity soundings to effective probing depths of 1-1.5 miles were employed to corroborate the geothermal gradient information, inasmuch as conductivity increases essentially linearly with temperature in a nonsaturate electrolyte. The discovery that some hitherto unmapped faults in the Imperial Valley are spatially related to the abnormally high heat-flow zones gives rise to the hypothesis that the faults apparently serve as conduits of hot water rising from great depth, and spreading out through a permeable zone.

Corroboration of the geophysically derived geothermal and resistivity data is provided from correlation with some deep petroleum drill holes, verifying the validity of the approach. A number of prime development targets have been discovered, some of which will be soon tested.

INTEGRATED MARINE NAVIGATION
EVALUATION BY ELECTRONIC POSITIONING

O-3

R. Unger, M. J. Long, W. Hicks, and G. M. Gilbert

An eleven-line, 435 nm seismic survey is simulated off the Texas Gulf Coast for evaluation of doppler sonar/gyro/satellite navigation using hyperbolic electronic positioning as a reference. The Raydist beta net features a coverage of minimum variation lane widths and almost perpendicular intersections of the hyperbolas. Sky-wave interference in this area is minimum, and due to the station configuration there is no coastal interference. Maximum electronic positioning accuracy is further maintained by having the seismic lines follow the lines of constant phase difference as closely as possible. Raydist positioning accuracy is better than 25 ft for the entire survey and is checked against known fixed positions. The water depth variation stretches over the entire doppler sonar bottom tracking range. The survey design allows for extensive line intersection evaluation.

Part of the test survey is analyzed on a shotpoint-by-shotpoint basis. Analysis of the real-time data shows the differences in latitude and longitude and the variation in doppler sonar and gyro behavior along the lines. The sea test confirms the reliability of satellite position fixes and shows that they can be used for calibration and monitoring of the dead-reckoning sensors in open sea. Post-mission processing of recorded data by means of variance-weighted correction results in considerable improvement in position accuracy.

netic prospecting as it provides the potential detection depth of the electromagnetic system, while the resolution and conductivity of the zones with their apex well below have been readily detected by the subsequently confirmed by diamond.

can be described as a fixed gradient measuring device, transmitting loop on the ground, horizontal gradients of amplitude, vertical or horizontal magnetic field, the air by helicopter, along track, source, and perpendicular to the strike.

is particularly suitable for the investigation of structures having the characteristics, or magnetic favorable geology. Because of exploration it can be successfully deep sedimentary cover, deep cover (tropical areas), or in exploration has established bodies and a deeper search is

number of areas within the United States where Turair will have a definite

APPLICATION OF GEOPHYSICS
TO THERMAL AREAS IN MEXICO

M-25

G. and J. H. Sandoval O.

geothermal plants in the world is a function of geological structure and geology. The two problems faced by geologists in the exploration for geothermal areas are the volcanic pattern and two, to the economic significance of the

attempts had been made to apply geophysics to the search for geothermal energy in Mexico. The Institute of Geophysics, National University (I.G. U.N.A.M.) and by the Instituto de Investigaciones Cientificas y Electricas (IIE) of the Federal Government, Mexico Government has been devising a geophysical method of assistance in their search for geothermal energy based on resistivity surveying. This method resulted in developing a geophysical method of assistance in their search for geothermal energy. The seismic refraction method has been adopted in recent years in the exploration which has been made in Mexico.

geophysical methods used in research for geothermal energy, applied, there are some as-