further comparison of modern and ancient deposits improves our means of mining and utilizing coal.

SYLVESTER, ARTHUR G., Univ. California, Santa Barbara, California

Wrench Fault Tectonics

Relations among basin formation, sedimentation, and uplift in response to wrench faulting are well documented, especially in California, and together with rock and clay model laboratory studies, the California examples provide considerable insight to the mechanics of wrench fault tectonics in both space and time.

Wrench faults are produced in both pure and simple shear deformation, but it is the unique nature of strain in simple shear which leads to the characteristic en echelon arrangement of related folds and faults, structures which constitute the principal traps for hydrocarbons along wrench faults in many parts of the world.

Coalescing and rotated fractures combine within the length of the fault zone to form a braided arrangement of faults around lozenge-shaped, uplifted, and downdropped blocks. Whether an uplift or basin develops depends on the bending geometry of the fault segments and the sense of slip across the wrench fault zone itself. Adjacent highlands along such tectonically active zones may shed great volumes of generally coarse sediment into these equally tectonically active basins, and such basins are typified by unusually thick sequences of coarse clastic sediments stacked in a shingled or Venetian-blind-like arrangement.

The structure along the edges of the uplifted blocks may be complicated in detail, involving the geometrical interplay of steeply and gently inclined strata together with variable components of dip and strike separation on faults of diverse attitudes. It is along these complicated fault block margins, however, where favorable traps for hydrocarbons can be anticipated and have yet to be explored in many areas.

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Prediction of California's Next Earthquake

A great earthquake, centered near Los Angeles or San Francisco, has the potential to be the greatest natural catastrophe ever to strike the United States in historic time. According to some estimates, as many as 10,000 people could be killed, 100,000 could be injured, and up to $40 billion damage could occur.

Against this threat, many state and federal agencies, universities, and private consultants are working overtime in California to fathom the riddle of how and why earthquakes occur, in the hope of gaining understanding of the earthquake process, and leading to timely predictions to reduce the loss of life and property.

Following examples which have been variously successful in the People's Republic of China, Japan, and the Soviet Union, American seismologists are designing, testing, and studying a wide variety of instruments and initiatives they hope will be successful in making predictions routine. Techniques and instruments range from traditional seismographs, tiltmeters, and creepmeters, to monitoring changes of gravity, magnetic field, and resistivity, to observing behavior of kangaroo rats, emission of radon gas, and measuring levels of water wells.

Results have been mixed. No one has issued a formal prediction, which demands that the time, place, magnitude, and estimated effects be specified, but several earthquake alerts have been given. To confound matters, however, earthquakes have happened in the center of heavily instrumented areas without a shred of precursory warning. One statistician has said that at the rate we are progressing, we shall not have another chance to predict a great earthquake in California for 100 years if we miss the next one, which some experts say will happen in the next decade.

This lecture gives an overview of the problems and techniques of predicting California's next earthquake, together with a discussion of the status quo which, at the time this abstract was written, included a possible volcanic eruption a few hours' drive from downtown Los Angeles.

AAPG-SEG-SEPM PACIFIC SECTION MEETING

April 14-17, 1982 Anaheim, California

Abstracts of Papers

AHMAD, RAISUDDIN, Univ. Oregon, Eugene, OR

Lithic Wackes of Early-Middle Eocene Lookingglass Formation, Southwest Oregon

The early to middle Eocene Lookingglass Formation is exposed over a wide area in southwestern Oregon. The formation contains a thick sequence of turbidite deposits consisting dominantly of very coarse to fine-grained lithic wackes, with minor amounts of pebbly sandstone, siltstone, mudstone, or shale. Sediments, mainly from the Klamath region on the south, and partly from a volcanic arc on the east, were deposited in a north-trending fore-arc basin approximately 125 by 155 mi (200 by 250 km) in size.

Within the lower part of the sequence, the lithic wackes are mainly thick-bedded, normally graded, pebbly sandstones and very coarse to coarse sandstones that contain a shallow-water marine fauna. Channel-fill conglomerate lenses occur within some of the thick beds of sandstone. This part of the sequence is interpreted as a proximal submarine-fan deposit. The lithic wackes of the upper part of the sequence, however, generally form sheets of thinner bedded, medium to fine-grained sandstone with more matrix. They contain deeper water marine fauna and are devoid of channel-fill conglomerate lenses. This part of the sequence is interpreted as a distal submarine-fan deposit. Sedimentation took place at a high rate and was accompanied by rapid subsidence of the basin.

The lithic wackes have undergone fairly intense diagenetic alteration, which includes cementation by calcite, silica, chlorite, and clay minerals; the replacement of feldspar grains, lithic fragments, and matrix materials by calcite and chert; and the recrystallization of chlorite. Cementation and compaction have considerably reduced the porosity of these sandstones.

BAIXAS, F., P. HOOYMAN, and C. WU, CGG, R. INGUVA and L. SCHOCK, Univ. Wyoming, Laramie, WY

Application of Nonlinear Constraints to Processing of Seismic Data

Astronomers Gull and Daniell have developed efficient noise-reduction techniques to enhance radio galaxy displays. They used the information theory notion of entropy with a chi-square constraint. In these conditions, the criterion derivatives provide separate equations to estimate each processed sample at a very fast computation rate. The chi-square constraint serves as a global constraint and ensures the continuity of the process over a given area and yields a confidence level for the results. The full confidence situation corresponds to the standard stack, whereas the zero confidence level corresponds to a flat distribution (trace). By slightly decreasing the confidence level from 100% confidence, meaningful noise reduction is achieved.

This technique is applicable to the noise reduction of seismic data. At each time sample of a deconvolved gather, the mean and the standard deviation are associated within the chi-square constraint to generate a new stack estimator. Such a process may be effective in sharpening velocity analyses. This is shown on both synthetic and real data. This nonlinear constraint method can be advantageously compared with more classical semblance or coherency technique with respect to computer time and the number of selected parameters is minimum.

Bryan and Skilling tried a new statistic in order to obtain a better distribution of noise residuals. The proposed solution consists of constraining the standardized and ordered residual components of the chi-square to fit a theoretical normal distribution. In fact, the solution can be made more general according to the noise distribution, inferred experimentally from the data.

Attempts have been made to apply this technique to the same seismic data sets. The Gull and Daniell technique provided a first estimate, which served as a starting point for the second technique. Convergence was obtained after a few iterations and improvement of the solution with respect to a normal distribution was checked through a chi-square goodness-of-fit procedure.

BARLOW, STEVEN G., Thums Long Beach Co., Long Beach, CA, and WILLIAM C. TRACY, Union Oil Co., Long Beach, CA

Geology and Slope Stability of Point Delgata, California

Two bedrock complexes crop out at Point Delgata in northern California: a Franciscan melange complex composed of sedimentary rocks, pillow basalts, and glaucophane schist; and the Franciscan coastal belt complex composed mainly of interbedded shales and sandstones. Two Quaternary formations largely cover these bedrock complexes.

The major geologic structure is the northwest-trending San Andreas fault, which cuts Point Delgata and forms the contact between the two Franciscan bedrock complexes. This active fault has extensively deformed the Quaternary deposits. The Franciscan coastal complex has numerous folds with axes subparallel to the trace of the fault.

Over 50 recent slope failures have occurred within the mapped area. Rotational slumps and debris flows within soil horizons are most common. The predominantly sandy soils of the area were found to have an average angle of internal friction of 31.4°, and cohesion strength of 7.0 kg/m^2.

Under static condition, slopes greater than 40° are basically unstable, but, during a major earthquake, condition slopes greater than 20° would likely be unstable.

BARTLING, WILLIAM A., Chevron U.S.A., San Francisco, CA, and PATRICK L. ABBOTT, San Diego State Univ., San Diego, CA

Sedimentology of Upper Cretaceous Submarine Fan Strata, San Miguel Island, California, and Comparison to Selected Mainland Localities

Upper Cretaceous sandstone, mudstone, and conglomerate are exposed in an eastward-dipping homoclinal sequence at the western end of San Miguel Island. These strata were deposited in the inner, middle, and middle-fringe regions of a submarine fan during the Campanian and Maestrichtian Stages. Outer fan and basin-plain sedimentary rocks are absent, whereas thick sections of mudstone-dominated strata deposited in fan-fringe areas abound. The great thickness of the middle-fan fringe facies suggests that these rocks were deposited in an elongate basin, the long axis of which was oriented normal to the direction of sediment transport.

The middle-fan fringe strata on San Miguel Island are characterized by rhythmically interbedded mudstone, siltstone, and sandstone commonly found in thickening-upward sequences. The mid-fan strata are distinguished from outer fan and basin-plain deposits by the facies occurrence along strike from mid-fan channelized sequences, by paleocurrent indicators which trend subnormal to channel orientations, and by large- and small-scale slumping subnormal to channels.

The conglomerate clast suite on San Miguel Island is dominated by durable, but brittle, black dacites and plutonic rocks. Some black dacite clasts were shattered during transport to produce black sand grains that have given the sandstones a salt and pepper appearance.

Upper Cretaceous submarine fan strata in San Diego County contain a much smaller percentage of black dacite clasts than on San Miguel Island, but both are overlain by the same Eocene submarine fan strata dominated by Poway rhyolite clasts. This relationship suggests that these rocks were deposited as two separate, but closely adjacent, submarine fans which received coarse clastic detritus from similar and overlapping volcano-plutonic source terranes.

The Upper Cretaceous strata on San Miguel Island have been referred to the Jalama Formation as established on the mainland. However, the clast suites of the Jalama conglomerates in Santa Barbara County are dominated by metamorphic rocks which indicate a source terrane very different and separate from the volcano-plutonic dominated highlands that supplied detritus to the San Miguel Island and San Diego fans. Thus, the name Jalama Formation should not be used on San Miguel Island.

BARTOW, J. ALAN, U.S. Geol. Survey, Menlo Park, CA

Sedimentology of a Middle Tertiary Paludal Deposit, Northern San Joaquin Valley, California

The middle Tertiary Valley Springs Formation is characterized over much of its surface and subsurface extent in the northern San Joaquin Valley by yellowish- to greenish-gray claystone with crude wavy bedding and common clay-lined partings, fractures, and tubules. Common glass shards and pumice grains in this lithofacies have led previous workers to interpret it as altered vitric tuff or welded tuff, but the presence of unaltered glass in the claystone and in the interbedded vitric tuff argues against such a simple genesis.

Analysis of the mineralogy, chemistry, fabric, and organic content of a 26 ft (8 m) thick section at Wallace, Calaveras