maps document a detailed growth history of the Challenger diapir. DSDP drill holes 2, 3, and 87 provide age data for the grid.

Differences in the style of diapirism between the northern (Louann) salt province and the Sigsbee salt province to the south are due to the influence of the basement. Both the original distribution of evaporites and subsequent diapirism in the vicinity of Challenger Knoll are controlled by basement fault blocks of transitional crust that formed during the initial opening of the Gulf of Mexico.

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Subsurface Temperatures, Sacramento Valley, California: Guide to F-Zone (Forbes) Gas Accumulations

A complicated hydrodynamic system exists in the Sacramento Valley. Abnormally high fluid potentials are present regionally owing to regional tectonic forces, as shown by previous studies. Certain parts of the Colusa basin in the Sacramento Valley have significant near-vertical fractures which permit the rapid ascent of deep waters under channel-flow conditions, thus with a minimum loss of fluid potentials. The traps for the erratic F-zone (Forbes) gas accumulations are critically dependent, both laterally and vertically, upon the existence of these high fluid potentials as barriers to gas migration.

Advective water transport occurs along these near-vertical fractures under nearly isothermal conditions. The magnitude of the thermal anomalies caused by this transport is so large that the fracture-high potential features can be detected with conventional maximum temperature readings from well logs despite the considerable error in such values. Well-log temperature data are much more readily available than accurate subsurface pressure data. Thus, practical exploration for these elusive gas accumulations is facilitated greatly through mapping the subsurface temperature regimes.

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Petroleum Geology of Arabian Peninsula

Petroleum activities in the Arabian Peninsula show new trends in the 80s. Petroleum exploration is intensified and huge discoveries are anticipated. A giant Jurassic gas field along the coast of the Arabian Gulf discovered recently tops 150 tcf, the largest single reserve ever. Other giant oil fields in the area are undergoing expansion in development and productivity. Today, the peninsula, with a total area that surpasses one million sq mi (2,590,000 sq km), produces and exports more oil and gas and has greater reserves than any other area in the world. The excellent reservoir rocks are located in the Jurassic and Cretaceous formations between the Arabian shield and the Tethyan seaway. They represent porous and permeable marine cyclical beds sealed by impervious shales and anhydrites. Reservoir sedimentology was affected by two orogenies during Late Cretaceous and Pliocene time portrayed by the cratonic area to the southwest and the orthogeosynclinal area to the northeast. The eastern part was little deformed by these movements.

Land satellite images and remote sensing data are salient features of the modernized exploration technology of Arabia in addition to seismic and gamma ray–neutron surveys. The crude oils encountered have high gravity (30 to 40° API) and their sulfur content ranges from 2 to 8%. Shut-in pressures are abnormally high and may range to 9,000 psi (62,000 kPa). All producing wells in the region are flowing wells and none of them require pumping.

Despite temporarily imposed production ceiling to 13 million bbl/day by OPEC, oil discovery rate is growing, and production may soon increase to help alleviate worldwide energy shortages.

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Early Cretaceous Sedimentation and Tectonics in Southeastern Arizona

Sedimentary strata of Aptian to Albian age are widespread in southeastern Arizona, southwestern New Mexico, and northern Mexico. These rocks comprise a transgressive/regressive marine/nonmarine basinal sequence, locally over 3,000 m thick, of sandstone, shale, limestone, and conglomerate mapped as the Bisbee Group. In general, the nonmarine lower third of the sequence is composed of coarse clastic alluvial fan and basin-fill deposits of local origin and rests unconformably on rocks of Jurassic to Precambrian age. These syntectonic sediments were deposited during regional southwest-northeast extension where local fault-block uplifts bounded by northwest-trending normal faults created a basin-and-range paleogeography with isolated clastic-filled basins and mountain ranges rimmed by alluvial fans.

The marine and marginal-marine shales and limestones of the middle third are restricted to the southeastern part of the region and represent the northwestern end of a shallow marine sea (Bisbee Sea) which advanced northwestward across northeast Mexico from the Jurassic rift basins of the Gulf of Mexico. Shallow-water platform carbonates were deposited over a wide area, with coral-algal-rudist patch reefs localized over paleostructural highs. The upper part of the Bisbee Group is the regressive facies of this sea and is composed primarily of nonmarine deltaic (fan delta), lacustrine and fluvial sandstones, and siltstones.

This facies reconstruction suggests that differential vertical displacements along northwest-trending normal faults controlled the regional variations in thickness, lithology, and grain size in the Bisbee Group.

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Formation of Secondary Porosity in Sandstones: How Important is It and What are Controlling Factors?

Secondary porosity in sandstones may form by chemical dissolution of grains or cements. Care must be taken to distinguish between local dissolution and reprecipitation which do not increase the net porosity, and leaching which produces a net increase in the porosity, requiring a throughflow of large volumes of undersaturated pore water to remove the reaction products in solution. Such undersaturated pore water may be derived from: (1) meteoric water driven by a hydrostatic head; (2) subsurface pore water made acid by the release of CO_2 from maturing kerogen; and (3) clay mineral reactions involving transformation of kaolinite and smectite to illite and dissolution of feldspar and carbonate—($Al_2Si_2O_5(OH)_4 + KAlSi_3O_8 = KAl_3Si_3O_{10}(OH)_2 + 2SiO_2 + H_2O$).

In the Jurassic sandstones of the North Sea (Statfjord field), secondary porosity is formed during early diagenesis from meteoric water dissolving feldspar. However, the kaolinite formed as a product of the leaching may form aggregates of pore-filling cement, reducing porosity and especially permeability. Petrographic examination and microprobe analyses show that clastic feldspar is rimmed by authigenic feldspar indicating that leaching was not important in creating secondary porosity