Synsedimentary Deformation in Fossil Accretionary Prism, Greece

Structural and stratigraphic evidence demonstrates that Paleogene turbidites of the Politses Formation were progressively deformed during sedimentation. The Politses Formation is preserved in internally undeformed thrust sheets that are tectonically intercalated with sheets of severely deformed blocks of the formation. This imbricate stack is interpreted as a fossil accretionary prism.

The Politses Formation typically consists of hemipelagic red shales and limestones (basin-plain facies association) followed by thin-bedded terrigenous turbidites (fan fringe, interlobe and distal depositional lobe facies associations) which are overlain then by predominantly thick-bedded turbidites (depositional lobe facies association). This "normal" progradational sequence is interrupted by incised channel complexes which lie above basin-plain sediments and beneath fan-fringe deposits in some thrust sheets. Atypical facies organization suggests tectonic activity during sedimentation. Small-scale soft sediment deformation in the form of convolute lamination exists in about 20% of turbidite sandstone beds. Assuming that the deformation resulted from seismic activity, sedimentation rates and the distribution of structures indicate that seismic shocks affected the depositional area every 10 to 100 years on the average. The most important evidence for synsedimentary deformation lies in the distribution of marl marker beds among thrust sheets. The stratigraphic distribution of marls corresponds uniquely to individual thrust sheets. This and other sedimentological relations demonstrate that marl and turbidite accumulation was controlled by progressive tectonic removal of thrust sheets from active deposition. The absence of unconformities within thrust sheets suggests that the deep sea fans represented in the Politses Formation were deposited in a trench.

LOUCKS, R. G., and M. M. DODGE, Bur. Econ. Geology, Austin, TX

Sandstone Diagenesis in Geopressured Tertiary Gulf Coast Basin

Texas Gulf Coast sandstones have been subjected to several stages of burial diagenesis: mechanical compaction, silica and carbonate cementation, and cement and grain dissolution. Each stage is well-developed before the sandstone aquifer is geopressured; only iron-rich carbonate cement continues to be precipitated in the geopressured zone.

Fluids must pass through an aquifer for cementation to occur. Ideally there is minimal fluid movement in the geopressured zone because overpressuring requires the fluids to be trapped. However, if faults are periodically opened and fluids escape, a drop in pressure of the aquifer would result. Lower pressure would allow carbon dioxide gas to evolve and the carbonate equilibrium would then favor precipitation of carbonate minerals.

Evidence of the above process is scale precipitated in wells producing geopressured fluids. As the fluid pressure is lowered by production of the well, iron-rich carbonate minerals are formed. These carbonate minerals are precipitated because of a pressure drop which may be analogous to pressure drops along opened fault zones.

LOW, PHILIP F., Purdue Univ., West Lafayette, IN

Properties of Water in Clay Mineral Systems

Among the properties of water in clay mineral systems receiving special attention are specific volume, specific heat capacity, coefficient of thermal expansion, and viscosity. Every property, J, of the interstitial water is described by the equation $J = J^{\circ} \exp [\beta/m_w/m_m)]$ in which J° is the value of the property for pure bulk water, β is a constant and m_w/m_m is the mass ratio of water to montmorillonite—the clay mineral used as a prototype.

The swelling of clay will also be discussed and it will be shown that $m_w/m_m = \lambda\rho_w S/2(1\text{-}r)$ where m_w/m_m is the mass ratio of water to montmorillonite (or any other layer silicate), λ is the interlayer distance, ρ_w is the density of the interlayer water, S is the specific surface area of the clay and (1-r) is the fraction of the water in interlayer regions. In this equation, λ is a function of the swelling pressure, π. If λ is the same for all clays at any given π, the equation indicates that a plot of m_w/m_m against S for different clays yields a straight line. Experimental data show that this is the case. Then the value of λ at each of several values of π can be calculated from the slope, $\lambda\rho_w/2(1\text{-}r)$, of the corresponding straight line and the results used to make plot of π versus λ which should be valid for all clays. Finally, this plot and the foregoing equation are used to show how excess pressure develops in a shale from which water cannot escape when the geostatic pressure increases or when S decreases owing to the conversion of montmorillonite to illite.

LOWRIE, ALLEN, and WILLIAM P. SEARCY, III, U.S. Naval Oceanog. Office, Bay St. Louis, MS

Multi-Parameter Regional Mapping and Interpretations

A global mapping program of those geologic parameters that may influence acoustic propagation through the ocean floor has evolved a number of mappable parameters including bathymetry, physiographic provinces, surface sediments, sediment thickness, paleomagnetic anomalies and age of seafloor, inferred thickness of lithosphere, heat flow, potential temperature of deepest waters, areas of possible bottom current activity, acoustic velocity of deepest waters, acoustic velocity in uppermost sediments, calculated ratios of acoustic velocity along water-sediments interfaces, possible petrologic provinces within lithosphere, roughness of acoustic basement, regional structure, and earthquake locations.

Mapping efforts present maximum detail consistent with data and application of established geologic principles. In areas lacking sufficiently definitive data, a reasonable interpretive fabric is shown. By interrelating appropriate parameters, greater interpretive accuracy is routinely possible.

The principal correlations between parameters are