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Panoramic View of El Papolote diapir, La Popa Basin.

Structural and Sedimentological Response to Diapirism in La Popa Basin, Mexico

Abstract

Upper Cretaceous to Lower Tertiary evaporite diapirs and evacuation structures exposed in La Popa Basin, northeast Mexico, controlled depositional patterns of sediment that accumulated adjacent to the rising salt masses. The superb exposures in La Popa Basin provide an excellent, accessible outcrop analog with which to test and calibrate salt-tectonic models derived from scaled laboratory and computer models or high-resolution seismic and well log studies of subsurface salt bodies ubiquitous in the Gulf of Mexico and other areas of petroleum exploration such as the Caspian Sea and offshore West Africa.

Strata interpreted as diapiric growth deposits flanking the diapirs display depositional thinning toward the diapir, abrupt lateral facies changes, and intense local deformation. Growth strata deformed by uplift of the rising evaporite masses were subsequently locally truncated by erosion associated with diapiric flaring or the movement of salt glaciers that repeatedly advanced and retreated over the seafloor surface. Advancement of the glaciers provided a mechanism of deforming and completely overturning underlying strata. Retreat of the glaciers corresponded to formation of erosional (locally angular) unconformities overlain by conglomeratic debris derived from failure of sediment mantling the salt glaciers. Repetition of this process resulted in the formation of progressive unconformities and growth strata analogous to those described in the proximal portions of fold and thrust terranes. However, this distinctive growth stratal geometry and unconformity bounded repetition of facies is primarily the result of halokinetic processes forming "halokinetic sequences." Periods of salt flaring and glacier development apparently correspond to periods of slow sedimentation during regional maximum flooding events.

Two types of salt bodies are recognized in La Popa Basin, small scale (< 2 km diameter) salt stocks with subcircular cross sections and large scale (>10 km long) arcuate salt walls. One of the largest salt bodies, referred to as La Popa structure, displays an evolution from salt wall diapiric rise to late-stage salt evacuation and formation of a counter-regional salt weld. Sediment dispersal patterns adjacent to this structure show drainage patterns roughly paralleling the structure and sediment ponding in the axis of withdrawal basins formed adjacent to the structure.

Biographical Sketch

Katherine A. Giles is an Associate Professor in the Department of Geological Sciences at New Mexico State University. Katherine received her B.S. in geology in 1981 from the University of Wisconsin, her M.S. in 1985 from the University of Iowa, and her Ph.D. in 1991 from the University of Arizona. Her research interests are in ⇒

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the interaction between tectonics and sedimentation patterns with specific emphasis on carbonate successions. Her research areas include phylloid algal mound complexes associated with Ancestral Rocky Mountain basins, structural and stratigraphic evolution of the Antler foreland system in Nevada and Utah, and Upper Paleozoic through Paleogene tectonic evolution of northeast Mexico with emphasis on reef atolls associated with salt diapirs in La Popa Basin, northeast Mexico.

Before joining the faculty at NMSU in 1993, Katherine worked for Exxon Production Research Company in Houston as a Senior Carbonate Research Scientist. It was here that she first became aware of the fantastic exposures of salt diapirs in La Popa Basin while working on a regional study of the circum-Caribbean basins.

Katherine A. Giles

Katherine has received an honorable mention award from SEPM for excellence in oral presentation at the 1997 Annual AAPG meeting. She is currently serving on the Executive Committee of the New Mexico Geological Society and is a member of AAPG, GSA, NMGS, WTGS, and PBS-SEPM. ❑