Omoa of northwest Honduras, Central America. This model and the similarities between the facies herein described and braided alluvial deposits formed in other humid settings (proglacial) suggest that the deposits of ancient humid alluvial fans may be readily distinguished from those of arid fans.

Humid fans differ from arid fans with respect to slope, gravel roundness, downfan changes in roundness, the patterns of imbrication and long axis orientation, and the abundance of debris flow deposits. Humid fans display a gentle, smoothly sloping concave-upward longitudinal profile, whereas arid fans are steeper and typically consist of segmented straight sections, producing a profile which is concave upward overall. Deposits consist largely of subangular to subrounded gravels and there is typically little change in gravel roundness downfan. Unlike arid fans, angular clasts are rare in humid fans. Imbrication and long-axis orientation transverse to flow are each well developed and, although each may be present on arid fans, their development in a humid setting is more striking. The principal difference, however, is the complete lack, among proximal sediments, of evidence for debris-flow deposition.

Proximal-fan deposits of humid fans are very poorly sorted, clast supported, and have a matrix of granular sand. Deposits generally have a crude horizontal stratification. Distally, there are transitions from clast-supported fine gravel, through sand matrix-supported gravel, to granular sands. In distal-fan areas, horizontal laminations are the dominant sedimentary structure, although high- and low-angle planar cross-stratification and trough cross-bedding may also be present.

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Upper Permian Evaporites of Dolomite Mountains, Northern Italy

The Bellerophon Formation (Upper Permian) of the Dolomite Mountains in Italy is composed of evaporite and carbonate facies. The former are both supratidal (sabkha) and shallow subaqueous in origin. The latter consists of limestone, evaporitic dolomites, and dolomitic arenites. The rocks are underlain by continental clastics of fluvial and overbank facies and are overlain by a predominantly open-marine, shallow-water carbonate sequence. The facies reflect climatic variation, sea-level fluctuation, and changing sedimentologic conditions.

This area has undergone postdepositional tectonic deformation. The deformation is, in part, recorded in a variety of structures in the Bellerophon Formation. Tectonic stylolites, as a response to stress, are widespread in the carbonate facies. In the evaporite facies, deformational fabrics are more varied. Flow structures and mylonitic textures clearly reflect bedding-parallel shear, whereas in the layered dolomite-evaporite parts of the sequence folding is a more common response to tectonic deformation.

Recognition of the extent and nature of these varied structures provides a greater understanding of the geologic history of this and adjacent regions. The deformation seen in the evaporites may provide clues to an understanding of fluid migration in other tectonically stressed areas in which evaporites are found.

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A Stable Isotope Study of Carbonate Cements in Sligo Formation

The Sligo Formation in Texas is an Early Cretaceous subsurface carbonate sequence representing the upper part of a transgressive cycle. The Sligo carbonates attain a maximum thickness of 305 m at the ancestral shelf edge where the sequence consists of rudistid boundstones and grainstones at depths of 4,570 m.

Porosity and permeability within the Sligo are controlled by the abundance of radiaxial fibrous calcite cement and/or coarse equant-calcite-spar cement. Other cements recognizable in thin section are meniscus calcite and clear euhedral dolomite. The equant calcite spar has an average of $\delta^{18}O$ relative to PDB of -1.92 and $\delta^{13}C$ of 2.80. The radiaxial fibrous calcite has average $\delta^{18}O$ of -1.77 and $\delta^{13}C$ of 1.61. The average whole-rock values are $\delta^{18}O$ of -1.52 and $\delta^{13}C$ of 2.61. The similarity between these values suggests isotopic homogenization due to diagenesis; however, the equant-calcite spar has a range in $\delta^{18}O$ of -4.98 to 0.29 indicating deposition by meteoric waters. The radiaxial fibrous-calcite cement has a narrow range in $\delta^{18}O$ of -2.10 to -1.70 consistent with an origin as an early marine replacement cement.

Intriguing correlations exist between modal abundances of cement types and their $\delta^{18}O$ and $\delta^{13}C$ values. These data provide important constraints for models predicting porosity and permeability evolution during carbonate diagenesis and have important implications for hydrocarbon exploration strategies.

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Tidal Deposition of Cypress, Ridenhower, and Bethel Sandstones (Chesterian, Late Mississippian), La Salle Anticlinal Belt, Lawrence and Crawford Counties, Illinois

Sandstones in the Chesterian (Late Mississippian), including those in the Cypress, Ridenhower, and Bethel, are major oil producers in the Illinois basin. Significant oil reservoirs occur as structurally influenced stratigraphic traps along the northwest-trending La Salle anticlinal belt of Lawrence and Crawford Counties, Illinois. Analyses of electric logs, sand thickness maps, and sedimentary structures show that these sandstones were deposited in tide-dominated deltaic, tidal-flat, and subtidal environments.

Coarsening upward, tide-dominated deltaic sequences inferred from spontaneous potential (SP) log signatures are composed of prodelta shales, delta-front shales and silts, and distributary-mouth bar sands.

Tidal-flat sand bodies are indicated by SP log signatures with blunt bases and tops. Cores from these 20 to 70-ft (6 to 21 m) thick, laterally discontinuous units contain: (1) fine to medium-grained, rippled sandstone with infrequent rippled shale laminations, (2) lenticular bedding with little bioturbation, (3) flaser bedding, (4) bioturbated sandstone and shale that were apparently horizontally bedded, (5) plant fragments in shale, and (6) channel lag consisting of deformed shale clasts and rounded carbonate mud pebbles.

Off the flanks of the anticlinal belt, the Cypress, Ridenhower, and Bethel coalesce into single massive sand units up to 200 ft (61 m) thick, distinguished by blocky SP log signatures with abrupt bases and tops. Sand thickness maps showing these units as long linear bodies aligned parallel with major anticlinal axes suggest that they are subtidal sand ridges.

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Role of Algal Assemblages in Middle Ordovician Deposits in St. Lawrence Lowlands