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Evaporites: A review from around the world and into the past

Environments that may result in deposition of evaporites occur in a sedimentary continuum which begins in the subaqueous hypersaline and extends up into the subaerial continental. The ability to distinguish in which depositional environment a particular evaporite sequence was deposited may be critical in determining the nature of adjacent reservoir rocks.

Evaporites are unique among sedimentary rocks in that recent areas of evaporite deposition are generally not representative as models for many ancient deposits. The evaporitic sabkha model of the Trucial Coast has often been misapplied to many ancient evaporite sequences, especially the wide-spread salt/anhydrite sections deposited on vast epeiric-sea platforms. Although many evaporitic rocks are now recognized as being subaqueous in origin, there is a general lack of corresponding recent depositional models. The best examples of recent subaqueous evaporite deposition are numerous man-made solar salt works in semiarid regions of the world.

The Late Miocene (Messinian) sequence from the Mediterranean basin is an excellent example of near-recent subaqueous deposits. Rock data from Deep Sea Drilling Project cores on the floor of the Mediterranean basin, as well as outcrops from the island of Sicily, illustrate a facies pattern of hypersaline carbonates to thin to massively-bedded primary crystalline gypsum to a variety of bedded salts. Because of regressive infill of the Miocene basin, each facies is, in part, time equivalent to the rest.

Likewise, the Mississippian (Osage) Mission Canyon sequence of the Willston Basin illustrates several depositional characteristics of subaqueous evaporite deposition. Wide-spread, massive anhydrite as a lateral facies equivalent of restrictive carbonates, as well as thin salt lenses, are present. In addition, cores from Little Knife field show preserved primary textures (anhydrite dewatered from gypsum) of shallow subaqueous deposition.

Supratidal (sabkha) sequences are characterized by thin (tidal) cycles with nodular and bedded evaporites. The original sulphate may be gypsum or anhydrite. Subaqueous sequences tend to have thicker cycles with more massively-bedded evaporites. The original sulphate is almost always anhydrite. Both types of deposition seem to favor the formation of dolomite reservoirs in adjacent carbonate rocks.