Salt-Floored Basins: A New Basin Sub-Class Along Passive Margins, A Description of the Lousiana Offshore

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The northern Gulf of Mexico/Louisiana offshore is described as a new sub-class of passive margin basins: a salt-floored basin. The prerequisite is that there was a period of salt deposition during the transition from fresh water deposition to salt water deposition. This salt layer then serves as a lubricating/separating layer along which over-riding "shallow" sediments migrate and/or prograde basinward over underlying "deep" sediments. Shallow means shelf and upper slope whereas deep sediments are from lower continental rises and abyssal plains. The characteristics of a lubricating/separating layer are salt welds and salt units comprised of myriad shapes. A salt-floored basin's ocean-side would be a "salt nose", a paleo-Sigsbee Escarpment complex, which exists when enough terrigenous sediments have accumulated on the landward/up-dip side to extrude the now buried and semi-plastic salt. The extruded salt nose becomes a down dip, basinward migrating "front".

A salt-floored basin is different from the two existing hypotheses describing major salt movement along the Louisiana margin. The hypotheses involve: a) salt rising buoyantly from mid-Jurassic crust and later deformed laterally, and b) salt extruded down-dip into the "deepest" basin with salt becoming buoyant on over-riding basement highs while migrating basin-ward. The salt-floored basin concept provides a "constant" salt nose migrating basinward as the basin expands.

Synthesis of Dolomite and Related Mineral Assemblages at Ambient Temperatures and Pressures

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From a study of existing areas of Recent dolomitization in conjunction with the"Oil Shales" of the Green River Basin, it was determined that it is possible the formation of dolomite and associated mineral occurrences is the result of the natural mixing of two very different types of waters and the salts they contain in solution. One type is formed from the evaporation of sea water. The salts involved are magnesium sulfate, magnesium chloride and calcium sulfate. The second type is the "fresh" water soriginating from the land. The salts contained in these waters are sodium bicarbonate, sodium carbonate and trona. Trona is a mixture of the two sodium salts.

These are all metasalts and are found in nature in desert, erg or arid tidal flat areas. They are stable in the host waters but become very unstable when mixed together or if the pH of the host waters is altered.

A series of simple informal experiments was done to observe the results of combining the various salts in both fresh and salt water. The mixing of the above named salts produced dolomite, protodolomite, calcite, magnesian calcite, aragonite, nesquehonite, hydromagnesite, magnesite and a possible calcium-enriched magnesite.Sodium sulfate and halite are formed in solution with carbon dioxide given off as gas.

In addition to the minerals formed, many sedimentary features also appeared which mimic those observed in the naturally occurring rock. Aragonite needles can be precipitated from a milky solution by adding sodium bicarbonate to salt water saturated with gypsum. Unconsolidated lime sand can be cemented with aragonite using the same mixture and allowing it to set for several weeks.

Replacement of one mineral by another can be effected by varying the pH of the host liquid. Aragonitic shell materials can be converted to gypsum in a matter of hours by placing the shells in varying solutions containing magnesium sulfate, magnesium chloride, hydromagnesite or nesquehonite and acetic or carbonic acid. Aragonite will slowly leach away and be replaced by spar calcite when placed in a solution containing hydromagnesite and sodium carbonate.