g21 Tertiary salt domes of Late Jurassic salt < oil & gas, sulfur >

> The word *salary* was derived from the Latin term *salarium* which was the name for a soldier's pay in the army of ancient Rome. The pay included a large ration of salt [also the root word for sauce and salad], which was a spice of high value and also a medium for exchange; thus the origin of such expressions as "salt of the earth" and "worth your salt." —trivia, Gunther Salt Company.[1]

Salt diapirs (piercement domes) have their explanation in the weight of sediments accumulating on layers of salt. When sufficient pressure of overburden exists, salt mobilization occurs. Sediments compacted by pressure at depths below 1200-1500 m can have an overall column density greater than halite (which has a density of about 2.2 gm/cc). Salt below then flows laterally to form diapirs that rise buoyantly.[2]

Salt domes, which reach the surface, flow out. In arid environments, salt flows can survive as visible extrusions (as in the Persian Gulf). In moist environments, solution of the salt top of the rising diapir, leaves concentrations of calcite and gypsum as a brecciated cavernous caprock. Near-surface salt is extracted by "dry" room-and-pillar mining or by solution mining.

A great, seaward thickening, wedge of deltaic sediments extends laterally east across Texas and the Deep South states and reaches south far out into the Gulf of Mexico where it still accumulates sediments (currently 200 billion kilograms yearly).[3] Back toward its source, it is a succession of filled subsidence-basins that formed as underlying salt yielded to prograding overburden to flow horizontally to where it feeds the upward flow of salt diapirs. In the Louisiana region of the Gulf of Mexico, salt domes (as the 40,000 foot deep salt column that off the coast flows out as Avery Island—163 feet high and 2 miles in diameter)[4] began their rise in the Tertiary. The innermost (oldest) basin became filled with terrigenous sediments of Cretaceous age; as is known from contained extensive reefs with rudists (in drill-core samples). The mobilize salt itself is Late Jurassic Louann Salt. Its origin can be explained in terms of the initial opening of the Atlantic:

Atlantic ocean magnetic anomaly stripes record that only a narrow, land locked, north-south strip of southern North Atlantic deepsea floor existed during the late Jurassic. The northern continuation of this narrow gulf was cut off by a transform fault that ran east. Its southern continuation was cut off by a transform fault that ran west and linked to a narrow east-west gulf that was the beginning-opening of the Carribean. The initial Caribbean seaway widened by downwarping of its periphery where, before improved circulation of a widening deep sea stopped it, one thousand meters of evaporites, mostly halite and gypsum, accumulated.

Salt that has flowed is nonporous and, as salt is also oil insoluble, it is thoroughly impermeable to oil and gas. Where oil bearing strata are punched through and upturned by the salt diapirism, oil and gas in their up-dip migration become trapped against the salt. Salt domes show as negative anomalies in detailed gravity-survey maps. This knowledge aids oil and gas prospecting (but oilmen will never tire of reminding that Titusville, Spindletop, and the East Texas Field were drilled against the learned advice of the then geologists). In the Gulf region, huge exploitable amounts of vuggy native sulfur are found in the caprock of salt domes. In the Frasch process, air and super-heated water is forced down wells to melt the sulfur and bring it to the surface. In 1894 when the inventor Herman Frasch successfully demonstrated this process in Louisiana, Sicily's sulfur monopoly was broken.[5]

Caprock native-sulfur is not found where salt domes penetrate nonpetroliferous sediments (as is so in the Mediterranean Basin, and the Near East). Where there are occurrences, oil and gas enters near-surface wet porous gypsiferous rock and, Claude ZoBell discovered in 1946, at low geothermal temperatures feeds anaerobic bacteria which by their metabolism reduce gypsum to crystalline sulfur and create an environment that precipitates calcite.[6] ❑