

NATURE OF GROWTH OF LOUISIANA SALT DOMES AND ITS EFFECT ON PETROLEUM ACCUMULATION¹

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ABSTRACT

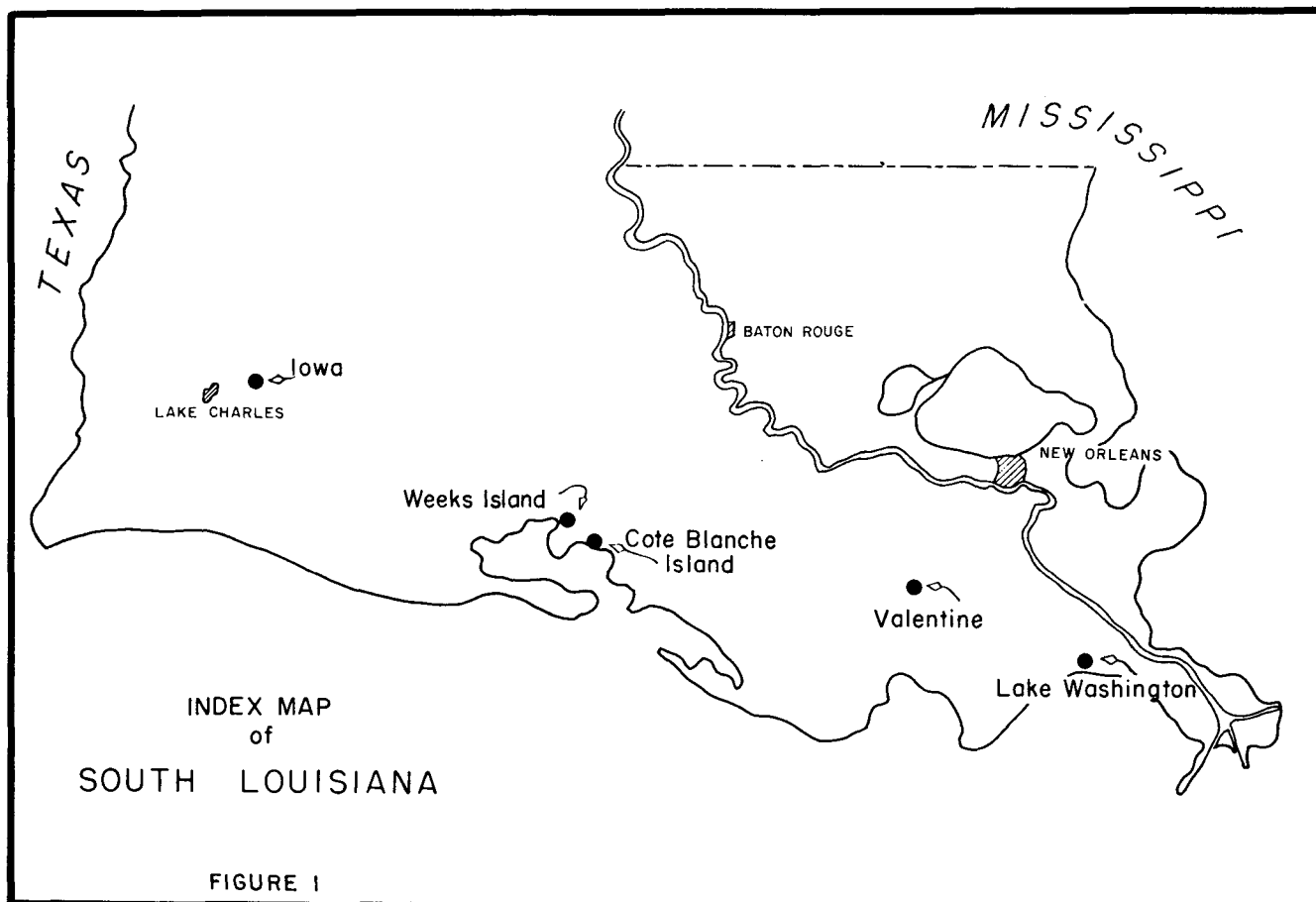
Intensive and deep drilling on piercement salt domes of southern Louisiana has yielded a great amount of new information on these features. These data demonstrate that many salt domes exhibit variations in structural configuration which depart considerably from older concepts of salt dome growth and from results of scale model studies. Some of these structural abnormalities have played an important role in the accumulation of petroleum.

Detailed studies indicate that the growth of salt domes in this province has been characterized by intermittent periods of movement. Furthermore, evidence now indicates that, in some cases, upward movement of salt from the deeply-buried salt mass has varied in location as well as in time. In some of these cases, early movements of portions of the parent salt mass formed low-relief structures in which early oil and gas accumulation took place. More recent growth of the present salt stock, peripherally located to the older structure and intrusion, has formed new traps of higher struc-

tural position into which the earlier accumulations of petroleum have migrated. In other cases, more recent growth of the salt stocks has merely truncated the older structures, disturbing them little, if at all. In these cases, the petroleum reserves are still found in the "fossil" structures, which have discordant relationships to the present salt mass.

In addition to the major shifts of loci of salt intrusion, movement of the salt within the present shallow piercement plug has not been uniform throughout the plug. This irregularity of upward flow is demonstrated by the different structural positions of major flank segments, local unconformities on restricted flank areas, shallow salt spines and deep-seated shoulders on salt masses.

Shale sheath material, enveloping the salt, is observed, in some cases, to intrude the normal sediments, behaving as does the salt and forming an integral part of the intrusive domal material.



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It is important to recognize that the configuration of the present shallow piercement salt stock reflects the combined effects of various localized salt movements. Moreover, the structures created by intrusive salt (and accompanying shale) movements have been intermittently altered by shifts in the locus of movement. Petroleum accumulations in some structures have been transient in nature and the locations of present reserves represent only the result of the most recent adjustments. In other structures, petroleum accumulations represent "fossil" fields which bear little relationship to the present salt stock.

Examples of some of these phenomena associated with salt dome

growth are presented by studies of the Cote Blanche Island Dome, the Iowa Dome, the Lake Washington Dome, the Valentine Dome, and the Weeks Island Dome (figure 1). Each of these represents an important field and each illustrates the controlling influence that its growth history has had on the accumulation of its petroleum reserves.

Application of concepts herein developed regarding the nature of salt dome growth should be considered in planning exploration programs around the flanks of piercement salt domes, and may lead to reinvestigation of nearby areas previously condemned as occupying off-flank or synclinal positions.