Deepwater Compressional Salt Tectonics along Passive Margins: Examples from the Atlantic Margins

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The Atlantic Ocean margins contain some of the largest salt basins along any passive margins in the World with Morocco, Nova Scotia, Santos-Campos-Espirito Santo and the Gabon-Congo-Angola Basin being the largest.. All of these basins have produced important diapirs and salt pillows during the early phase of rifting and thermal subsidence, and these structures are very often reactivated by later compression. The compression can be caused by either:

compression at the frontal toe of downslope gravity sliding systems which produces important salt nappes and compressional thrust and folds in the deepwater area; or

regional tectonic compression events, caused by plate tectonics or hot spot development, where simultaneous folding can occur across 100+ km wide areas.

This paper examines the different styles of compressional structures which are produced along the Atantic margins. The tectonic style depends on the thickness of the salt, the thickness and strength of the overburden, and the tectonic stresses. Large tectonic stresses can lead to thrusting and duplication of the salt, with imbricate seismic reflections present within the thrusted salt packets, which are probably slivers of sedimentary overburden caught up in the thrusting and recumbent folding. Thicker overburden and thicker salt with lower tectonic streses applied tends to favour fold development. In this case large packets of sediments may have been already laid down over the salt structures which had become inactive before their later compressional reactivation.

The effects of tectonic reactivation of continental margins can produce spectacular submarine mountain belts. In Angola for example, the frontal thrusted allochthonous salt sheet has produced 2 km of relief at the top of the Albian carbonate horizon. This was caused major uplift onshore starting at approximately 30 Ma. Buried folds of this magnitude are also produced in the Moroccan offshore area during the Alpine-Rif orogeny, and these produced very large structural closures capable of trapping hydrocarbons in the Doukalla Basin. However, in some areas the late compression may have created faulting up to the sea bed and breached earlier hydrocarbon traps.