

# EXPLORATION BENEATH THE SALT

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The prospectivity of stratigraphically younger sediments beneath a salt layer has held oil and gas explorationists' interest for years. The target of imaging technology has been to enhance the salt-sediment interface to efficiently optimise drilling in subsalt and presalt plays.

It is estimated that there are over 100 salt basins located around the world. To complicate matters, over 35 of those are described as allochthonous sheet basins. (An allochthonous sheet is one which has migrated some distance from where it is now found.) Some of the more profitable allochthonous sheet basins are the South American Santos, Campos, and Espirito Santo Basins; the western African basins in Angola and Gabon; in eastern Africa the Madagascar Offshore Salt Basins; and in North America the Nova Scotia and Gulf of Mexico Provinces.

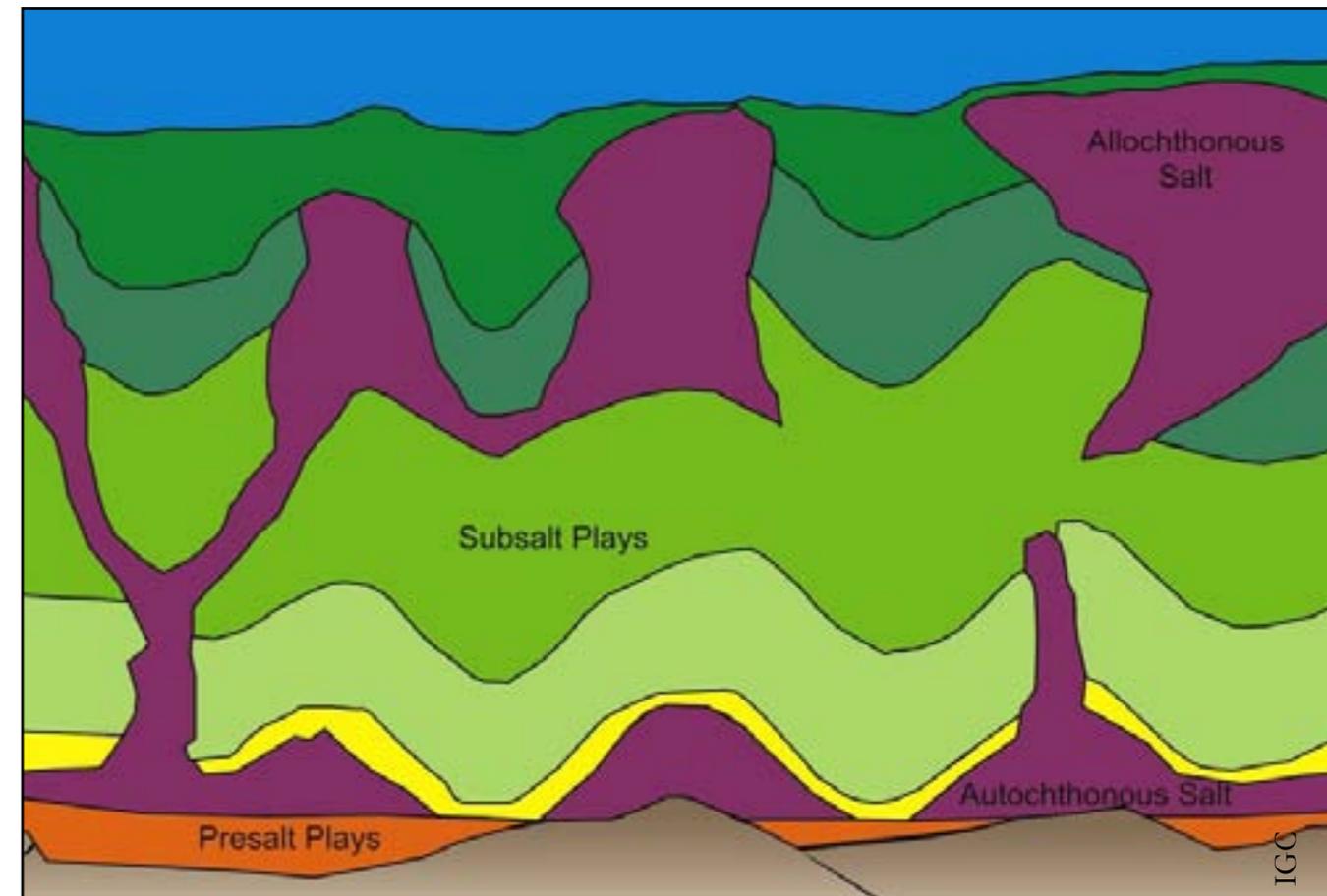
The prospectivity of stratigraphically younger sediments beneath a salt layer has held oil and gas explorationists' interest for a long time, but engineering technology has encouraged interest in the prospectivity of older sediments beneath salt in recent years. The target of imaging technology has been to enhance the salt/sediment interface to

efficiently optimise the drill bit location for subsalt and presalt plays.

## MODELLING THE SALT

An EarthModel, a geophysical/geological three-dimensional (3D) model of the earth, is best described in terms of its exploration objective. This means that when a geologic target is established, the model is designed to represent the geological environment surrounding the prospective target. Integrated Geophysics Corp. have been building EarthModels since the 1980s. Today they are a product of an integration scheme that encompasses all geophysical and geological information that can be made available for an interpretation of the salt tectonics. The greater number of constraints, the higher confidence in the model reflecting the in-situ situation.

Like seismic geophysicists, the gravity/magnetics (GM) geophysicists continue to develop

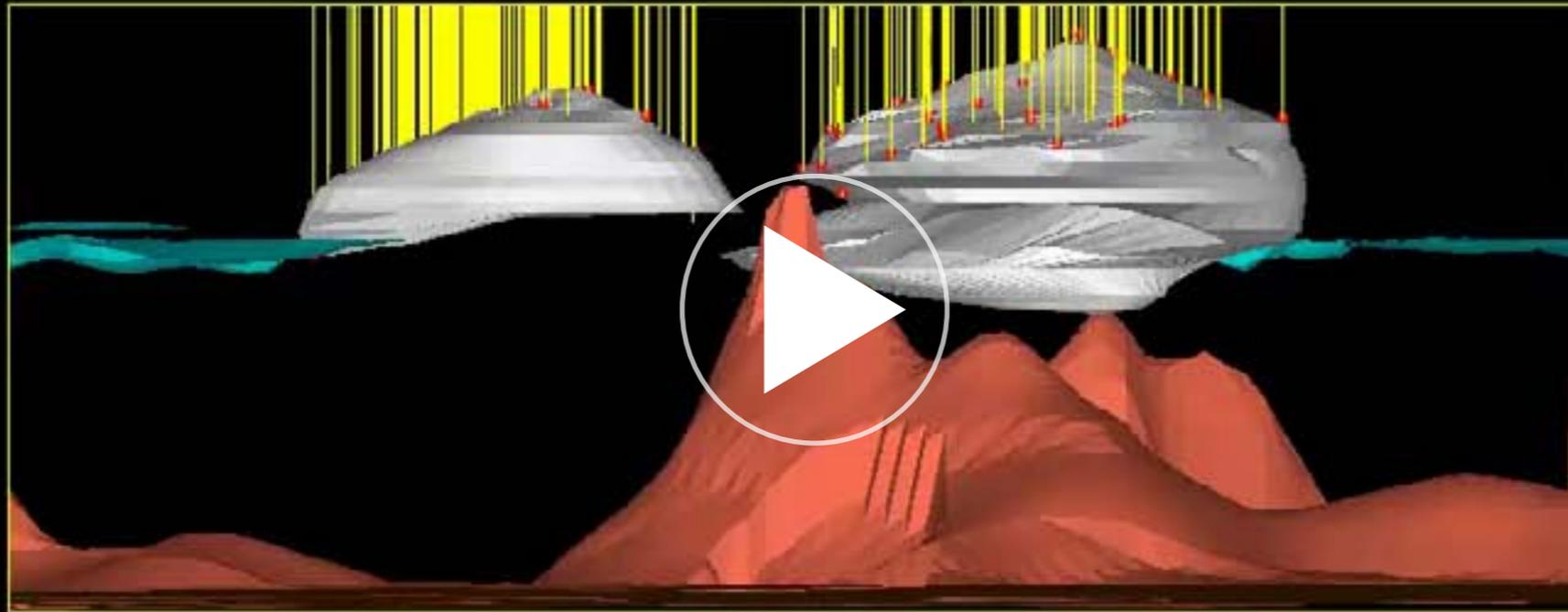


*For clarity, a subsalt play is defined as exploring beneath the allochthonous salt layer that overlies stratigraphically younger sediments, while in a presalt play we are exploring beneath the autochthonous salt layer that overlies stratigraphically older sediments.*

software and expertise for the refinement of the salt-sediment interface image. The gravity-based EarthModel is a density model derived from sediment interval velocities; it is constrained by

well control, magnetic basement structure, sediment sourced magnetic depth estimates and coherent seismic reflection-based layers. Current EarthModels are built with over thirty layers to





*Modelling the salt – a similar model could be built up in a salt basin anywhere in the world*

resolution diminishes as this layer thickens beyond 1,000m.

The autochthonous salt - the deeper, older in-situ salt - has recently gained exploration interest, with targeted sands lying deeper within the sedimentary section. In many locations the base of the autochthonous salt

is initially considered to be the basement surface. Related isopachs of interest would be firstly, the salt thickness between the top and base of the autochthonous salt, and secondly the inter-salt sediment isopach defined as the sediment thickness between base of allochthonous (shallow) salt layer

to top of autochthonous (deeper, older) salt layer.

The geometry that salt intrusion takes is non-predictable yet measurable. How the salt structures influence oil and gas migration pathways is always being studied. Understanding and refining salt features with

confidence has significant impact

#### ADDITIONAL INFORMATION

**Integrated Geophysics Corporation**

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