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Gravity Driven Tectonics and Deep Offshore Petroleum Systems

Most of the major deep offshore oil and gas discoveries have been made in four Atlantic passive margin basins : Gulf of Mexico, Campos Basin, Lower Congo Basin and Niger Delta Basin. These deep offshore provincies are all affected by gravity deformation related to salt or shale decollement levels.

The observed deformation and sedimentary infill can differ from one basin to another or can even laterally vary within the same basin. Locally, it is often difficult to separate the lateral and vertical components and their respective impact on the parameters of the petroleum systems. Nevertheless, the analyses performed at different scales using different approaches have allowed the definition of genetically related mechanisms which control the geometry, kinematic evolution and finally prospectivity of these oil and gas provinces.

The aims of this paper are:

- to illustrate, with examples from the different basins, the way structural evolution controls the distribution of source rocks and reservoirs, the timing of HC generation and migration, the location of the migration pathways and also the efficiency of the traps.

- to propose

- a zonation of the deformation from a landward extensional domain to a basinward compressional domain which can be related to the exploration success.

- a typology of gravity driven basins, based on the nature of the decollement level, the rate of deposition and the morphology of the margin.

Both zonation and typology provide guide lines for evaluating frontier basins or segments of margins where gravity driven deformation is locally poorly imaged by seismic acquisition.