Fault seal quantitative assessment in hydrocarbon-compartmentalized structure using fluid pressure data

GRAULS Dominique (1), PASCAUD Frederic (2) and RIVES Thierry (1)

(1) ELF e.p.t Avenue Larribau 64018- Pau FRANCE email : grauls@elf-p.fr

(2) GEOGRAPH rue Cail 75010 Paris FRANCE email :geograph@wanadoo.fr

Horizontal and vertical fluid flows are frequently controlled by fault networks, acting as semi-barriers through geological time. Quantitative and predictive assessment of fault seal efficiency is therefore of key importance, as the charging, trapping and preservation of hydrocarbon accumulations at depth are often fault-controlled. As presently emphasized, the use of *fluid pressure data (P),* recorded in compartimentalized structure, constitute the only available in-situ data for assessing the relative contribution of faults at field scale. The results of this approach, applied in a case study offshore UK, are summarized as follows : -**1/** The *fault lateral transmissibility* seems to be controlled by 3 main factors : *the fault throw* , related to the *thickness of damage zone* ; *the fault entry pressure* : high values are linked to the presence of clay smear or carbonate cementation, low values to cataclastic shear zones, and *the hydrodynamism or* the differential of hydraulical potential both sides of fault -**2/** The *fault vertical transmissibility* becomes predominant as soon as the lateral reservoir connectivity through the damage zone, for different reasons, is lost. In lack of lateral transmissibility, the fluid pressure (P) builds up inside the confined compartment, during the late Tertiary rapid burial, up to a hydrofracture threshold close to the in situ minimum stress (S3). Hydrocarbon migration will occur therefore by transient fracture reopening. -**3/** A *« sealing efficiency versus fault throw » quantitative relationship* can be applied for predicting the hydrocarbon potential of down dip compartments within a given structure or/and different structures, provided that geostructural histories are similar. -**4/** These quantitative results could be finally implemented both in *basin and reservoir modelling*, to account for the role of faults in reservoir compartimentalization.