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Turbiditic Sedimentary Environments Definition and Petrophysical Modeling with Seismic Constraints for an African Field Case

Aimed to assess the complementary development stakes of a field located offshore Nigeria which is already producing Pliocene turbiditic reservoirs, a set of integrated 3G studies was initiated in 2000. These studies were using the data of up to 45 Exploration and Appraisal wells as well as Development Phase 1 wells, coupled with a reprocessing of the 3-D seismic. A full set of seismic attributes is described to define for each reservoir level, a distribution of the sedimentary environments consistent with the sedimentological model, the morphologies seen on seismic cross sections, and the well data. A data analysis by ACP was made in order to quantify, for each reservoir level, the correlation coefficient between a combination of seismic attributes (Amplitude near/far, PseudoGR, Iso5, Neural Network ...) and each of the petrophysical properties as Phi & Sw. The petrophysical modelling itself, for example for the porosity parameter, is based upon three steps of constraints: – Constraint to low frequency variations of the seismic: environments are defined by geologists on the seismic attributes maps, – Constraint to well data statistics : average of porosity well data are imposed by environment and by layer, – Constraint to high frequency variations of the seismic: the interpolation between well data is performed using a cokriging technique with a fixed mean by environment and an auxiliary variable equivalent to all pertinent seismic attributes.