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Geological characterisation of complex reservoirs using 3D seismic: Case studies

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3D seismic allows getting a set of numerous closely-spaced seismic lines that provide a high spatially sampled measure of subsurface reflectivity. It leads to an accurate interpretation of seismic reflection data, which is one of the most important stages of a successful hydrocarbons exploration, especially in the reservoirs characterised by complex geological setting.
We present here two case studies pertaining to two Algerian hydrocarbon fields. Considering the positive results obtained from 2D seismic interpretation, several wells were drilled. Some of them have proved dry, due certainly to inaccurate seismic interpretation because of non standard geological context.
For the first case, the high quality of the 3D seismic data allowed to reveal, on all the inlines and crosslines, the existence of paleovalleys under the top of the Ordovician (unit IV) reservoir. The mapping of these paleovalleys clearly showed that the dry well, contrary to the other wells, was implanted outside paleovalleys. This fact was confirmed by the analysis of well data.
The second case study concerns the problem of andesitic eruptive deposits on the top of the Ordovician reservoir, which condition the geometry and continuity of this reservoir and cause uncertainties in the mapping of the Hercynian unconformity. Well data associated with 3D seismic response shows that eruptive deposits generate high impedance anomaly because of the high density and velocity of andesites. We used this information to interpret these eruptive rocks as being responsible of high impedance anomalies, inside the Ordovician reservoir, on the impedance volume generated from the 3D seismic data. A 3D extraction of the anomalies allowed an accurate localisation of the andesites.
So, it appears, according to these two case studies, that for an efficient recovery of hydrocarbons, we have to rely, first of all, on an accurate seismic interpretation before we use microscopic measurements. 3D seismic, once again, remains a key tool for risk reduction.