Neogene Turbidites in Tanger-Larache Blocks (Offshore Morrocco): From Seismic Interpretation to Sand Prediction

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Repsol Exploracion SA, gasNatural, Dana & ONHYM are exploring the Tanger-Larache blocks in offshore Rharb Basin on the Atlantic margin of northwestern Morocco.

Tectonism was active in the Moroccan margin and controlled both facies and architecture of Neogene turbidites. Extensional mini-basins formed at the late stages of the Rif- Betic orogeny due to collapse of the accretionary wedge at Tortonian-Messinian times. Supra-nappe gravitational normal faulting and related growth faults generated subsidence controlling sedimentation. In the onshore Rharb Basin, the onset of the extensional collapse is recorded by deposition of coarse sandstone turbidites on the bottom of extensional minibasins.

Several bright amplitude anomalies were identified on 2D and 3D seismic data sets. Reservoir presence is the key geologic risk as no sand was penetrated by the only well drilled in the offshore basin (Larache-1). Two independent but complementary techniques were applied to assess this risk.

We discuss the results of this analysis of one prospect. First, seismic stratigraphy geometry indicates channelised turbidites and lobe turbidites. Onlaps and depositional relief are interpreted as indicators of sand turbidites onlapping the margins of active mini-basins. Transition from incisions and “cut and fill” geometry to continuous lobate reflection packages indicate channel to lobe turbidite depositional environments, respectively.

Second, rock property modeling of onshore wells shows that acoustic impedance and shear impedance can be used to discriminate sands from shale. We conclude that very low acoustic impedance and high shear impedance indicates gas sand. The 3D seismic volume was inverted and tied to the Larache-1 well. The seismic anomalies described above exhibit both low acoustic and high shear impedance.

Mapped geometries of the anomalies from the inverted cubes are similar to the geometries interpreted from the seismic stratigraphic approach on the final migration data. Combining independent but complementary analyses supports the interpretation of gas-filled turbidite sands at our prospect. This will be tested soon by the drilling of an exploratory well.