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3D Seismic Geomorphology of a deep-water slope channel system: Offshore Trujillo Basin, Peru

Vladimir Cabello [1] , Alejandro Quispe [2]

[1] CNPC PERU S.A., Av. Paseo de la Republica 5895 Miraflores **(vladi.cabello@gmail.com)**

[2] Perupetro S.A., Av. Luis Aldana 320 San Borja **(aquispe@perupetro.com.pe)**

SUMMARY

It is prominent and well-know that numerous Deep-water Channel Systems are installed along the Trujillo basin presumably deposited during the Pliocene, which have been superficially identified in 2D seismic lines. In the last few years, a 3D seismic volume was acquired for this area, and is placed in the most extended part of the marine platform of the Peruvian coast with an average bathymetry of 300 meters.

The study indicates that this part of Peru offshore has similar characteristics in the morphology of slope channel deposits, to those in the southwest of California and West Africa (Angola), which ranks the aforementioned area among the world's main basins in terms of discovered reserves.

The interpretation of the 3D seismic volume gives us the opportunity to visualize these complex depositional systems, as well as to identify the geometry, distribution and recognition of the architectural elements of the system. But this was only possible by using 3D seismic interpretation techniques.

In this study, 3D seismic interpretation techniques include time slices, dip time slices, flattened horizon slices, geometric attributes, amplitude accentuating attributes, frequency decomposition, voxbody interpretation, AVO analysis and opacity rendering. As a result of applying these techniques, the evolution of the turbidite channels was delineated and understood with greater ease using geomorphological concepts. Thus, the 3D seismic interpretation allowed us to understand the spatial and temporal distribution of each turbidite channel as well as its architectural elements.

It should be noted that the quality of the seismic volume in addition to the use of these tools of interpretation allow a detailed analysis of this type of deposits. Therefore, it is imperative to encourage the use of these interpretation tools as much as possible. Even more, further detailed studies should be performed such as Rock physics in order to associate if a notorious anomaly that shows along the body of channel (HCI) observed in the 3D seismic volume is produced by fluid or lithology.

It is evident that deep-water deposits located in this part of the platform are a great opportunity for future objectives, considering that the chance of finding a prominent oil or gas reservoir is becoming increasingly challenging.

The present work covers mainly the most extensive area in Trujillo Basin.

CONCLUSIONS

Using these techniques of 3D seismic interpretation allowed us to identify and confirm exploratory opportunities (Leads and prospects) delineating their geomorphological characteristics in a versatile way in the Trujillo basin, facilitating geoscientists the interpretation of hydrocarbon potential. As for example the identification of turbiditic channels and their subsequent analysis from the geomorphological point of view.

The mentioned techniques provide a detailed analysis of the depositional characteristics of the illuminated bodies in the seismic volume, the use of the different seismic attributes allows us a better analysis and its subsequent relation to reservoirs with a high potential to contain hydrocarbons.

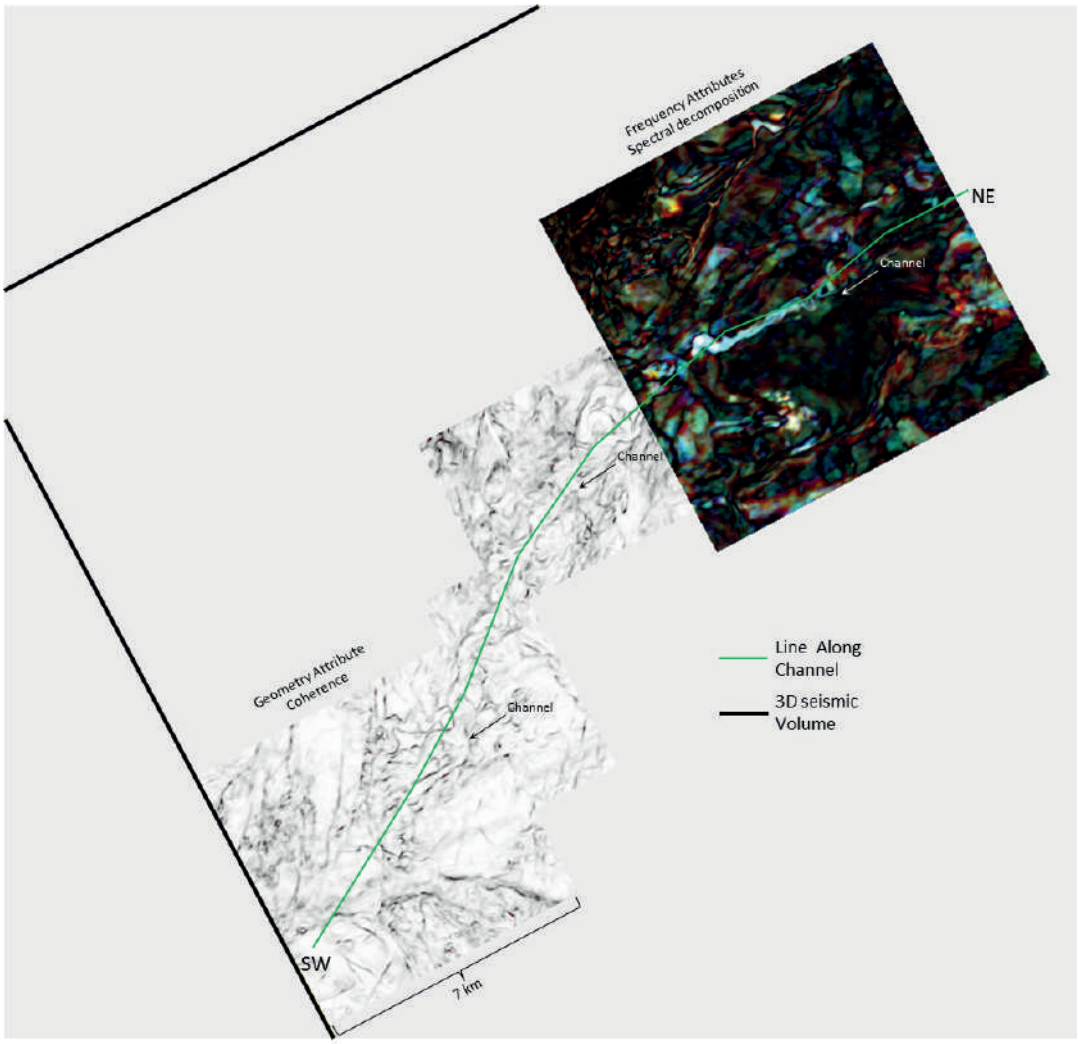

Figure 1. Map showing the extensions of turbidite channels in Trujillo basin.

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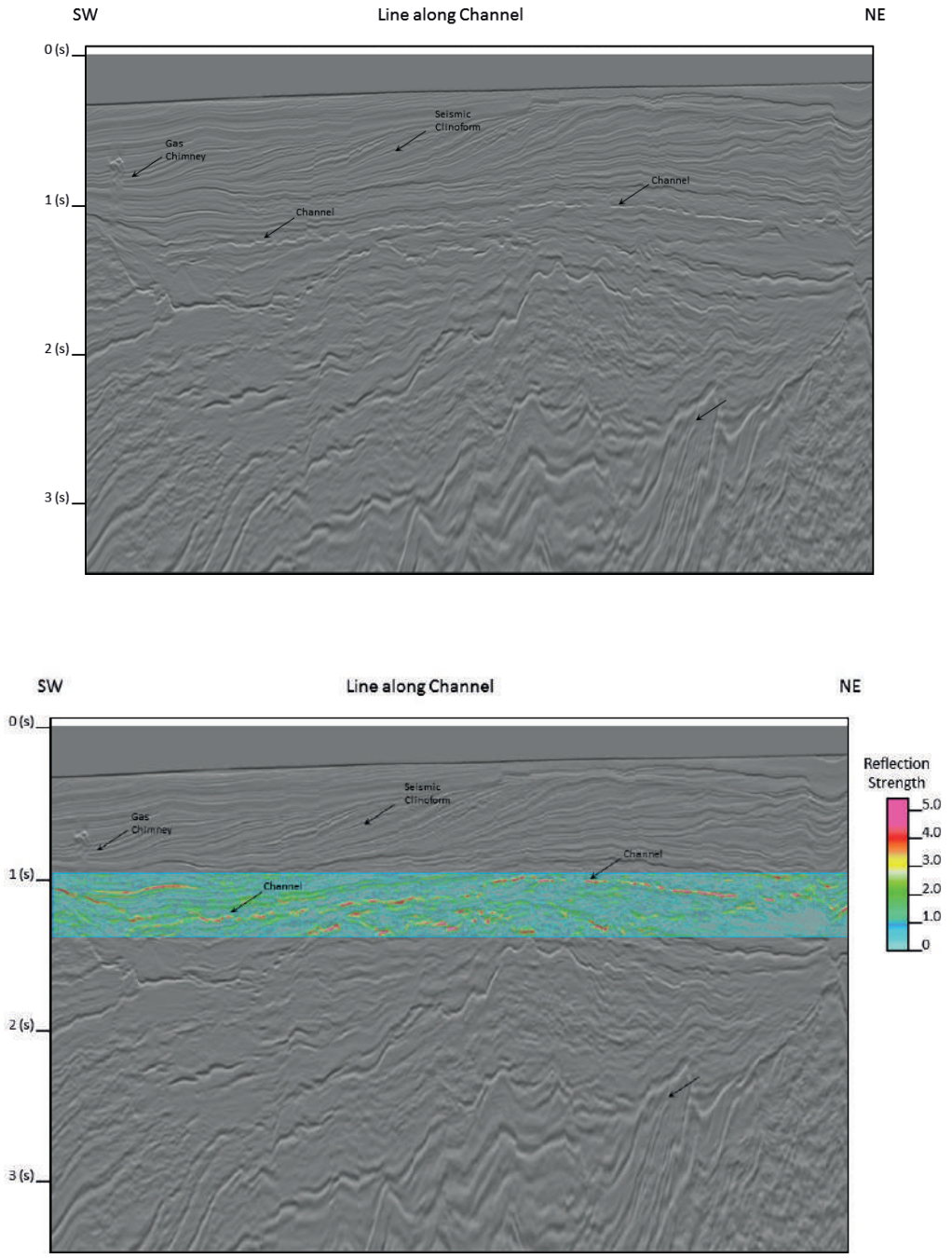

Figure 2. Seismic section along of turbidite channels in Trujillo basin, see location in Figure 1.