Supplementary data

Citation: Esquivel, L., Villamizar, F., & Molina, I. (2022). Interpretation of Palaeozoic geoforms with the use of seismic attributes in a region of the Eastern Plains, Colombia. *Boletín Geológico, 49*(1), 41-54. https://doi.org/10.32685/0120-1425/bol.geol.49.1.2022.557

1. Lithological description of the formations analysed

Sequence A (Guayabo Formation)

This formation is constituted by an alternation of very soluble grey claystones and poorly selected sandstones of fine to very coarse grain size, sporadically presenting conglomerate and carbonaceous levels. The palynological analyses indicate a late Miocene age for this formation (Hubach, 1957).

Sequence B (León Formation)

This formation corresponds to a set of locally bioperturbed black to dark grey mudstones and intercalations of fossiliferous layers with bivalves and calcareous concretions with macrofossils characteristic of estuarine environments; palynological analyses indicate a late Eocene-early Miocene age (Parra et al., 2010).

Sequence C (Carbonera Formation)

This formation is characterized by sediments deposited in estuarine environments and corresponds to a succession of sludge bioperturbed with sandy intercalations, with stratigraphically increasing successions between monotonous dark grey mudstones and fine- to medium-grained sandstones. Palynological analyses indicate an early Miocene age for this formation (Parra et al., 2010).

Table 1. Seismic and geophysical data provided by the SGC for the development of the project

Data	Information					
3D seismic	A 3D 297 km² seismic cube with PSTM (*prestack time migration*) processing					
2D seismic	Four lines with PSTM processing with the following lengths					
	Line 1	35.5 km				
	Line 2	77 km				
	Line 3	60 km				
	Line 4	33 km				
Wells	Four wells with the following geophysical records					
	Well	**Gamma ray**	**Density**	**Neutron**	**Resistivity**	**Sonic**
	1	x	X	x	x	x
	2	x	X	x	x	x
	3	x	X	x	x	x
	4	x	X	x	x	

2. Data

Table 1 shows the data provided by the Servicio Geológico Colombiano used for this project.

Synthetic seismograms

Figure 1 shows the Ormsby wavelet applied to well 3 to perform "mooring" with the seismic data.

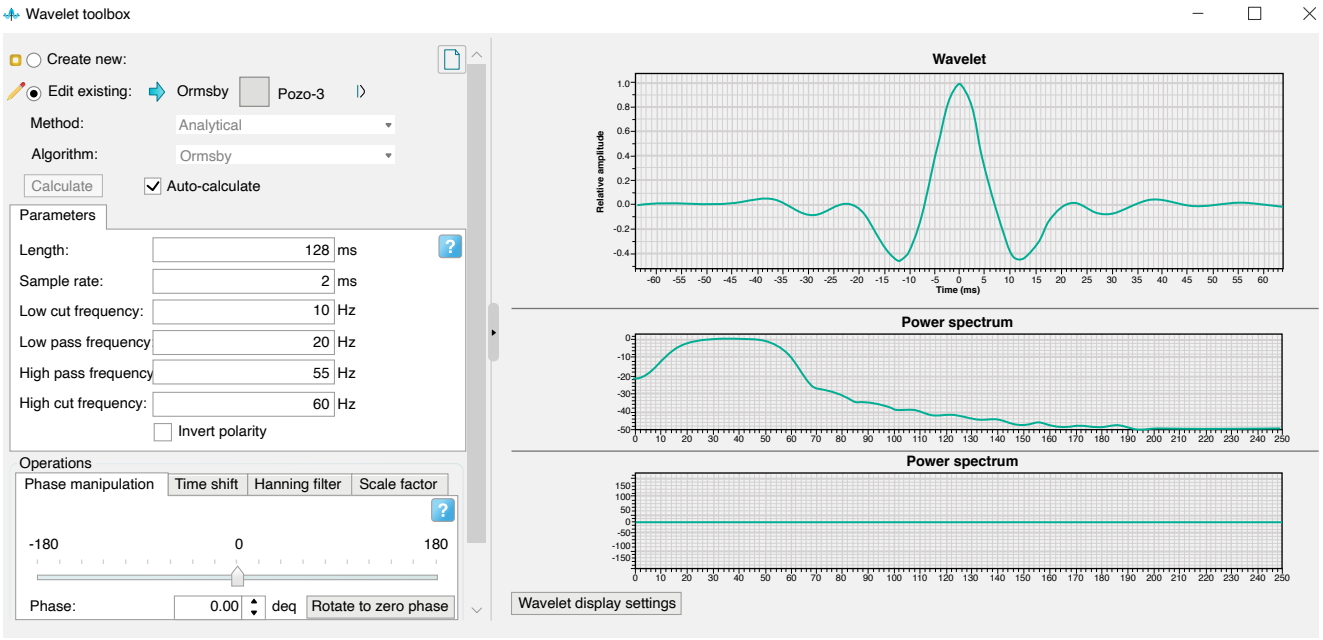

Figure 1. Waveform used for the synthetic seismogram of well 3

The synthetic seismogram of well 3 with the *Inline* 560 of the seismic block is shown in Figure 2. The seismic reflectors coincide with those generated by the synthetic seismogram, which implies correct mooring; subsequently, their interpretation was performed (Cabañas, 1996; Sheriff, 1997).

The same process was performed for well 2 with seismic line 3 and well 3 with *Inline* 560 of the seismic cube.

3. Interpretation of faults

Figure 3 shows *Inline* 650 with uninterpreted ABS processing (*simple amplitude*).

3.1. Structural maps

The seismic interpretation of the 3D volume allowed us to determine the levels of seismostratigraphic sequences C, D and E. These are shown in parallel throughout the seismic block, and on them, a fault system with a predominantly southwestern to northeastern direction (trend of failures) was defined, as shown in Figure 4.

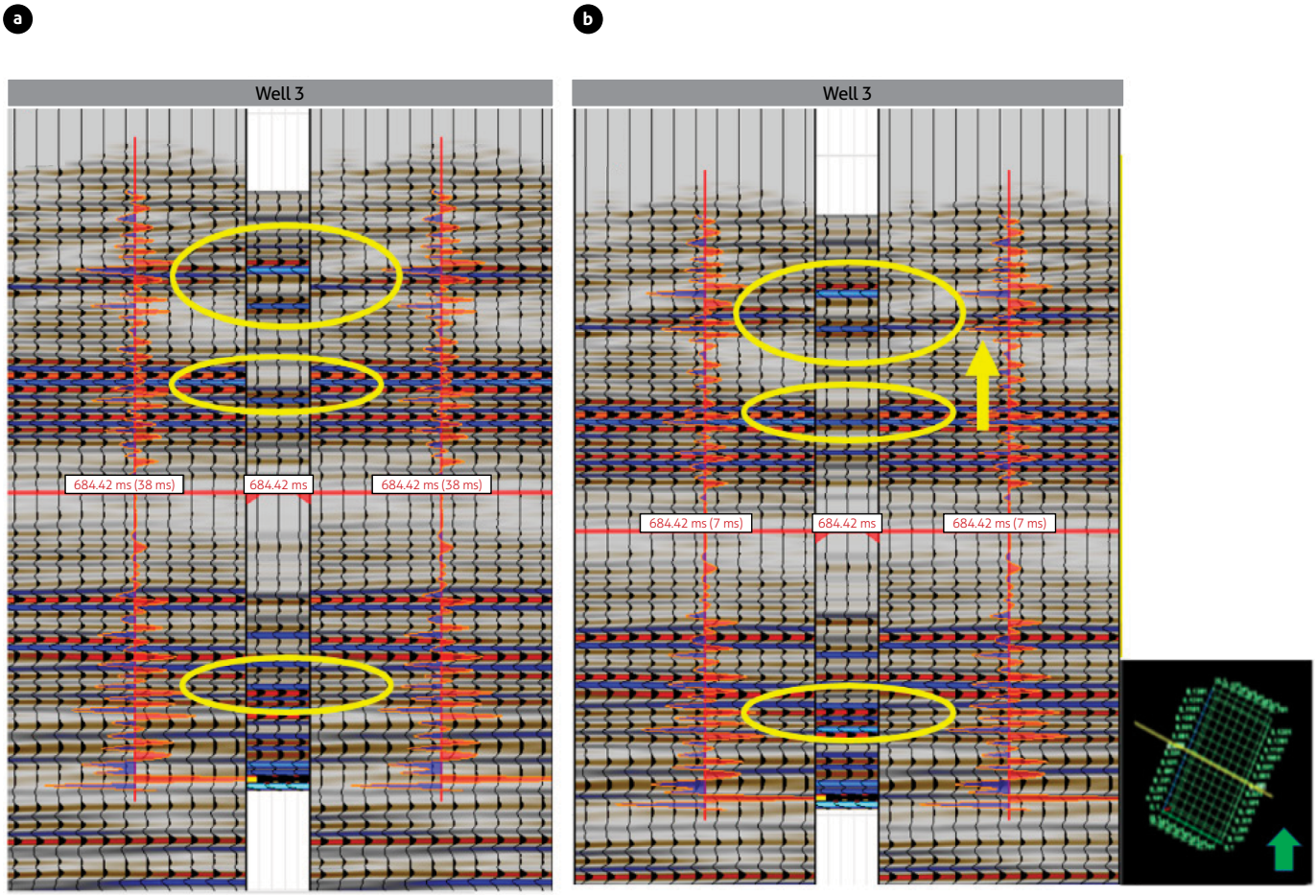

Figure 2. Synthetic seismogram 1 for *Inline* 560 of the 3D seismic block with well 3
a) Seismogram generated by Petrel; b) seismogram adjusted to seismic information

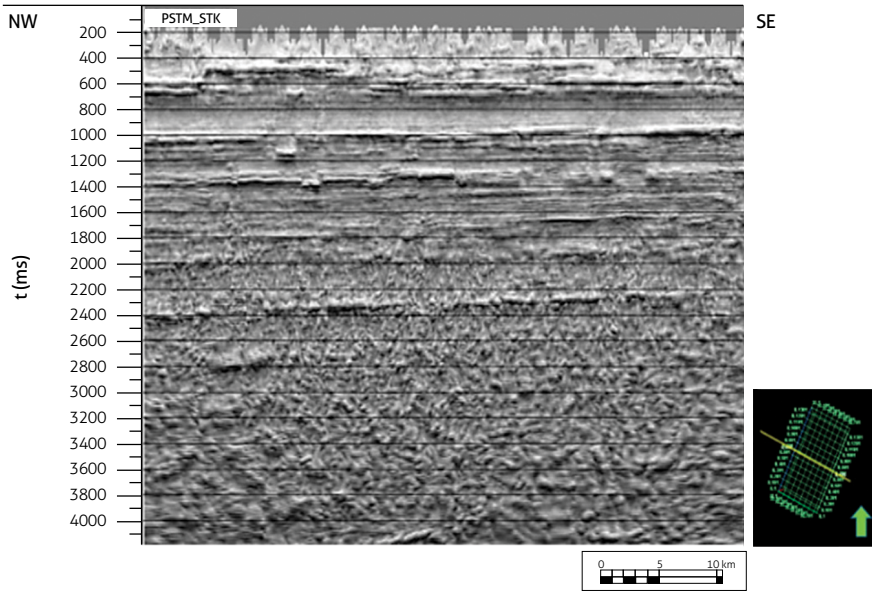

Figure 3. Inline 650 with simple ABS processing, without interpretation

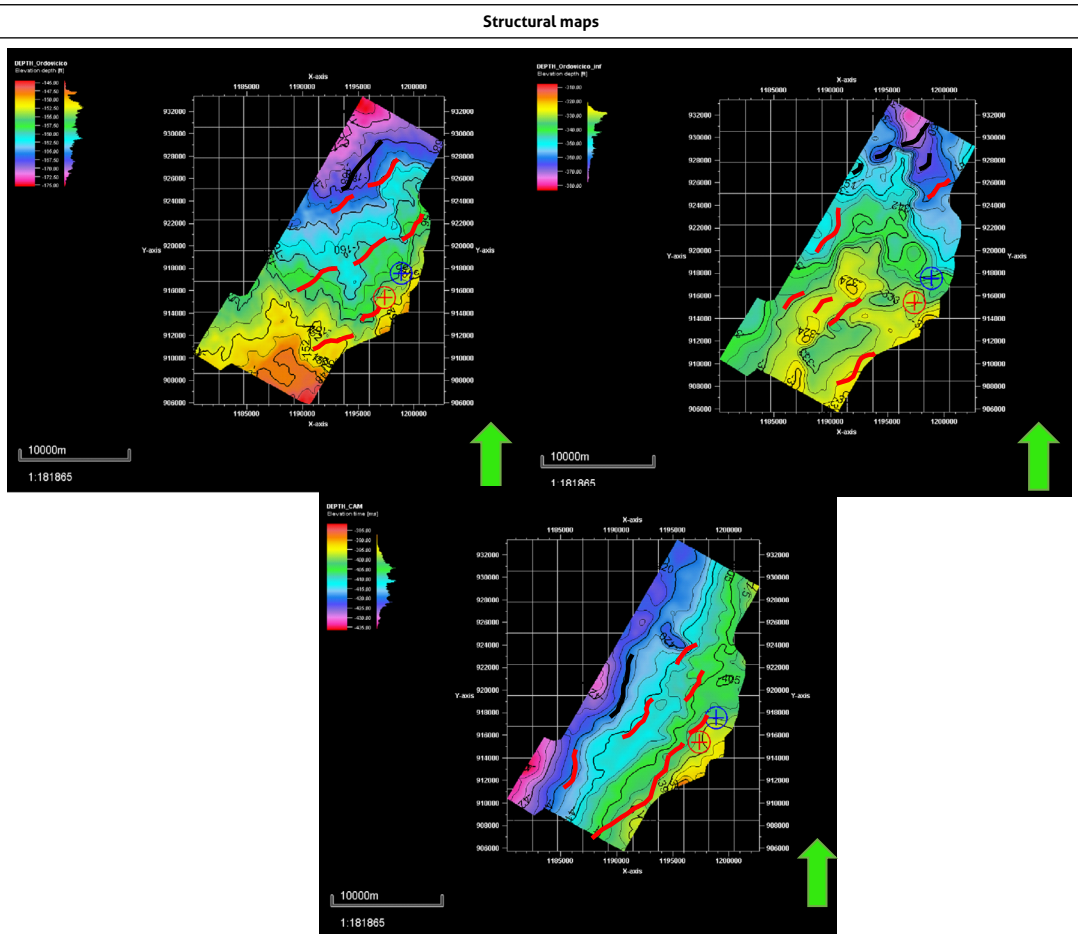

Figure 4. Structural maps of sequences C, D and E
The faults interpreted in the block are highlighted in black; additionally, the locations of the wells are shown (well 3: red cross; well 4: blue cross).

3.2. Palynological data

Figure 5 shows the report of palynological data from well 3.

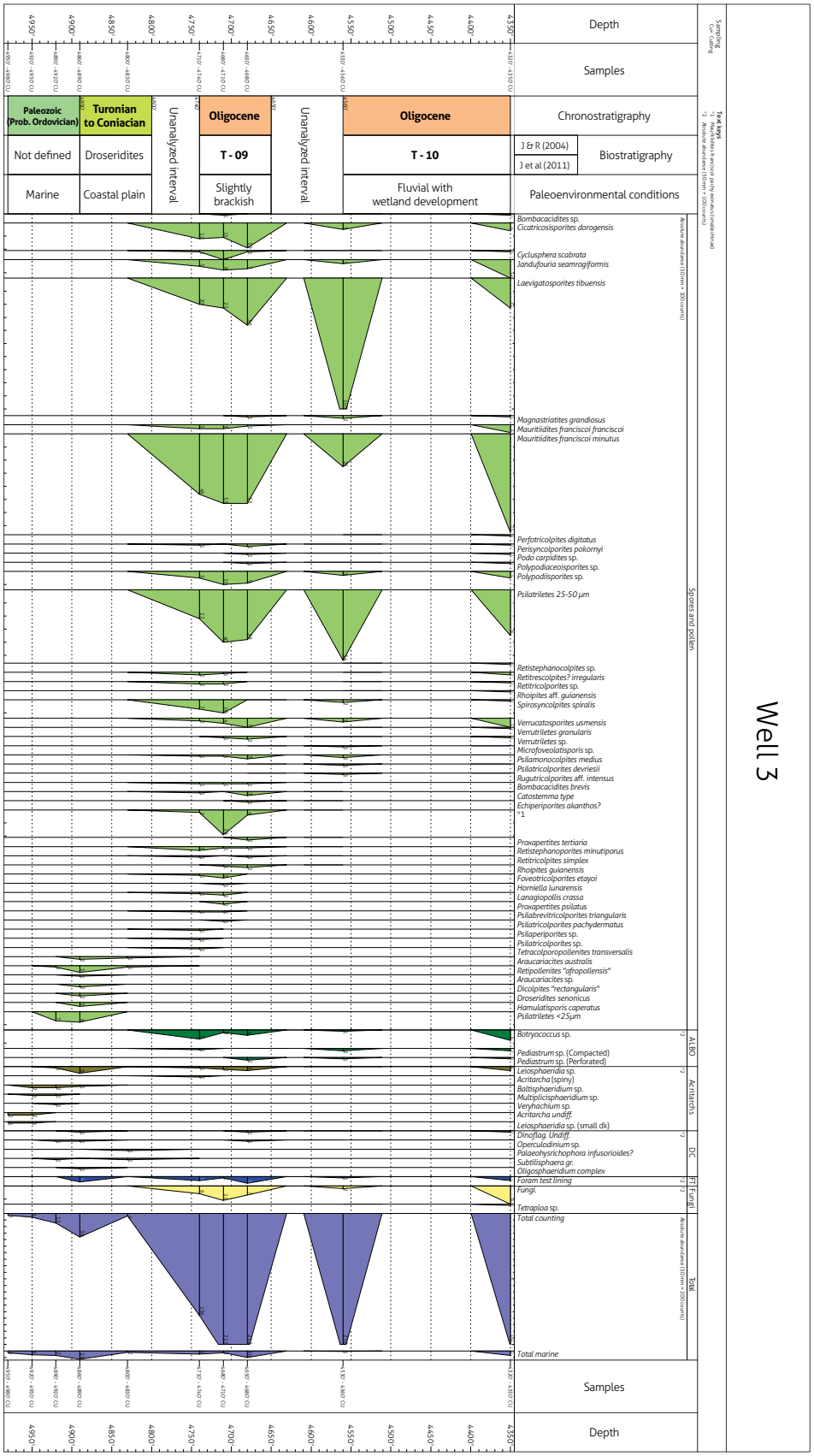

Figure 5. Palynological report of well 3

3.3. Geomorphological maps

Figure 6 summarizes the geoforms found in this study for each of the sequences analysed (Sangree and Widmier, 1977).

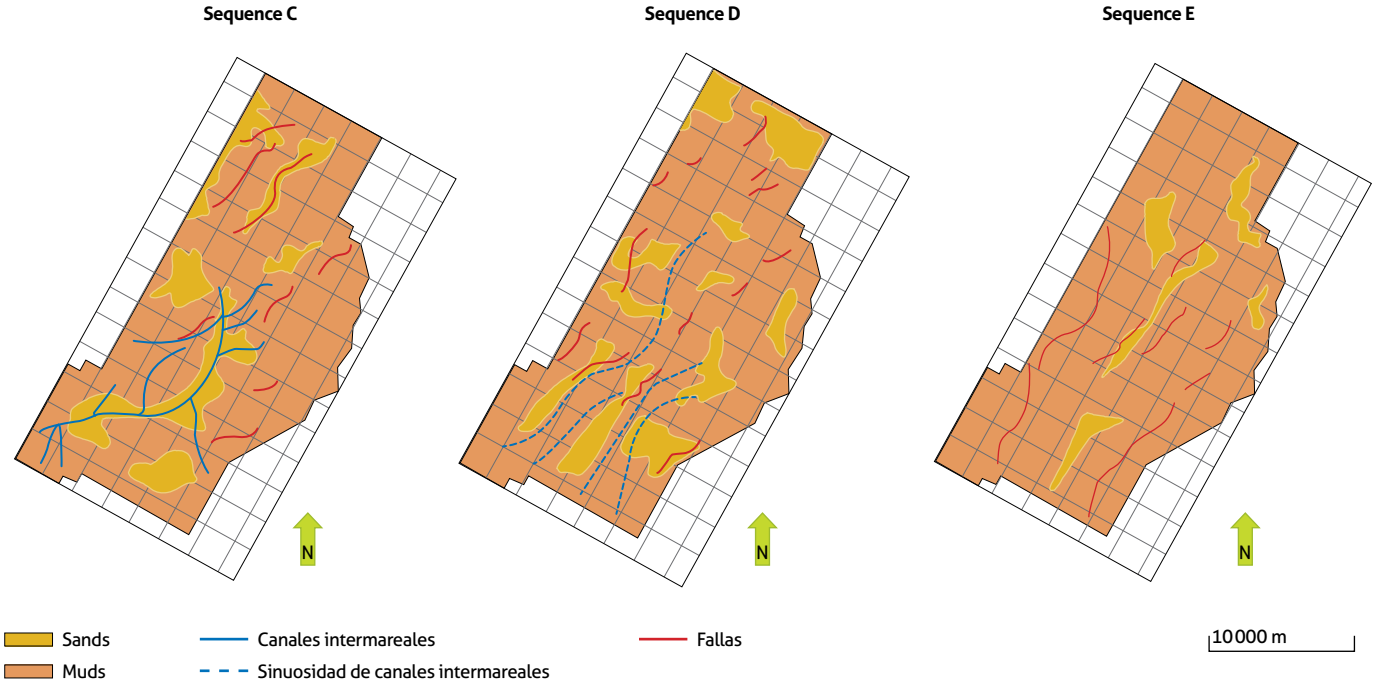

Figure 6. Geomorphological maps of sequences C (1192 ms to 1872 ms), D (1808 ms to 2196 ms) and E (1808 ms to 2796 ms).