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Detecting Lateral Continuity of Taranaki Basin Reservoir Sand Based On Sequence Stratigraphy and Seismic Attribute Analysis

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Abstract

Delineating lateral continuity of reservoir sand with few wells would be the most challenging part in any interpretation and this is one of the main factors that control the volumetric calculation of a reservoir. The lateral continuity in this paper referring to lateral facies changes and its varying thickness. When seismic encounters thinner sediments, the wavelets used to tune to be an unresolved reflections and it will not be shown under a broadband seismic dataset. However, thicker sediments in the other hand shows resolved reflections, which could be seen on the seismic. This paper describes on how spectral decomposition attributes can be used to delineate reservoir sand and to come up with the dominant frequency of a specific geobody. Apart from that, we also show how these seismic attributes will help in sequence stratigraphy analysis in recognizing the reservoir continuity.

Methods

Spectral decomposition is the main seismic attribute that was used in this study apart from Coherency, phase and envelope. Seismic data was decomposed into 10 different frequency bands with spectral volume that ranges from eight to 10 Hz. The frequency band decomposed based on the octave scale to in order for the wavelet to have same shape with stretch and squeeze version of each other. The spectral composition method was based on Gabor Morlet wavelets transform where the seismic data filtered by a series of Gabor-Morlet wavelets to produce a seismic volume with different frequency bands. The filtered amplitude represents an average amplitude and phase of the narrow band.

Summary and Conclusions

Use of Spectral Decomposition verifies the amplitude that decomposed at 10.3Hz shows more clear N-S trending channels compared to spectral slices that decomposed in the higher frequency (Figure 1). Higher frequency domain seems to have lower signal to noise ratio compare to the lower frequency. Identifying channels from its domain frequency could also help in knowing the thickness by reading the tuning thickness value. This helps in reconfirming the depositional environment and the Paleo currents, which associate to the sediment thickness. The sediment information best to incorporate with sequence stratigraphy to enhance the depositional environment model. However, subsurface geology is not as easy as we might expect and that is why we need collaborate different approaches in seismic attributes and more confirmation of modern and paleo analogues to come up with reliable reservoir model.

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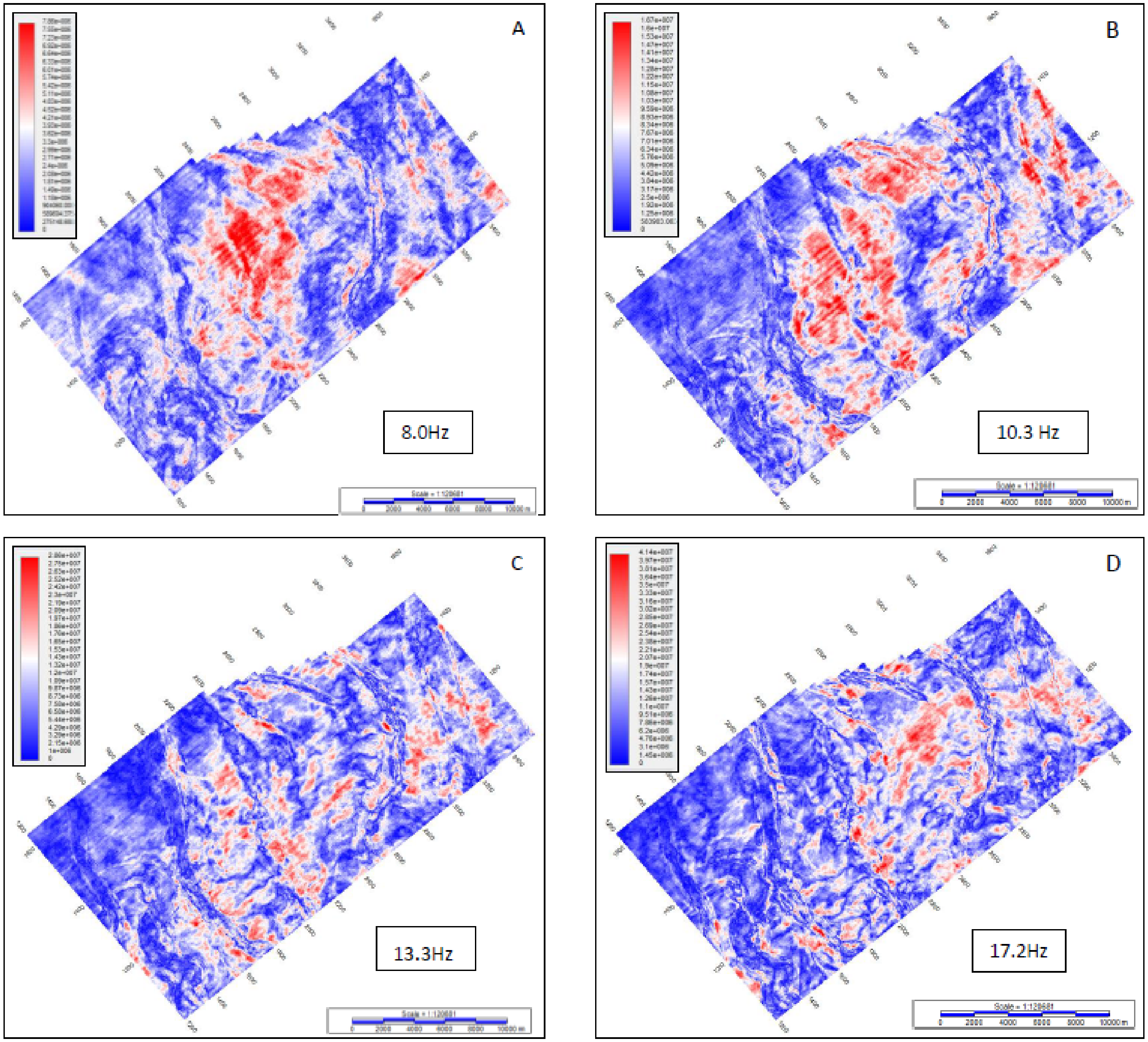

Figure 1. Showing spectral decomposition at 1.8 seconds slice. From A to D, the frequency increasing which means lower signal to noise ratio. Some channels standing out more clearly in a specific frequency, such as N-S trending channels in B and NW-SE trending channels in C.