APPLICATION OF SEISMIC ATTRIBUTES TECHNIQUE TO POST-STACK SEISMIC DATA FOR STRUCTURAL MODEL DELINEATION

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by

SYARYDHA FASSHA BINTI MARJAN

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Thank you to The Creator who awarded me the unbroken soul to finish this work. Encouragement, patience, and guidance from my supervisor, Dr. Amin Esmail Khalil has made me through it successfully. He always triggered me with his ideas. To my co supervisor, Professor Dr. Mohd Nawawi Mohd Nordin, he helped me in financial problem and gave me a chance in joining survey. Thank you to Opendtect Terranubis allowed me to use the data for study purpose. Thank you also to all my lab mate and geophysics staff who helped me and for sharing session. Lastly, I would like to say thank you to my mother, my father, my younger sister and my younger brother for their moral support.

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LIST OF SYMBOLS

A	Amplitude
i	complex number
F(t)	Complex trace
T^{-1}	Frequency
f(t)	Function in time, seismic trace
f*(t)	Hilbert's transform of T(t) in 90^o phase shift
y	Imaginary axis
A(t)	Instantaneous amplitude, Reflection strength
θ(t)	Instantaneous phase
iy	Imaginary part
λ	Wavelength
n	index
m	Offset
T	Period
θ	Phase, Angle
r	radius
x	Real axis
T(t)	Real component
x	Real number, Real part
s, t	Time
d(t)	Time displacement
ω(t)	Time dependent frequency, temporal rate change
z	Trace
v	Velocity

LIST OF ABBREVIATIONS

AVO	Amplitude Versus Offset
AI	Acoustic Impedance
CMP	Common Mid Point
DAS	Deconvolution After Stack
DBS	Deconvolution Before Stack
DMO	Dip Moveout
GRM	Generalized Reciprocal Method
QC	Quality Control
2D	Two dimensions
3D	Three dimensions

APLIKASI KAEDAH SIFAT SEISMIK TERHADAP PASCA-TIMBUNAN DATA SEISMIK BAGI PENGAMBARAN MODEL STRUKTUR

ABSTRAK

Paparan biasa pasca-timbunan data seismik kadang kala menyembunyikan maklumat penting. Pelbagai percubaan melintasi masa untuk meningkatkan kebolehan menafsir data seismik melalui sifat seismik. Pelbagai sifat seismik aktif berada di dalam industri minyak dan gas. Pada kajian masa kini, pasca-timbunan sifat seismik digunakan. Di antara senarai jenis sifat, tiga sifat dipilih untuk kajian ini. Sifat itu ialah frekuensi segera, amplitud segera dan fasa segera. Hasil yang baik daripada tapisan sifat frekuensi segera terhadap pasca-timbunan data bergantung kepada pemilihan frekuensi tertentu. Ia telah diambil kira bahawa batu yang berbeza pembentukannya mempunyai frekuensi yang berbeza. Oleh sebab itu, pemilihan frekuensi yang berbeza boleh membantu meningkatkan resolusi pada pasca-timbunan data seismik. Objektif utama kajian ini adalah untuk mengenal pasti frekuensi tertentu yang lebih sempit untuk meningkatkan gambaran pembentukan yang ingin dicapai dan untuk menganalisa reaksi daripada beberapa jenis pasca-timbunan data seismik. Untuk mencapai objektif, frekuensi tertentu yang sempit telah dikeluarkan daripada frekuensi keseluruhan. Tiga jenis pasca-timbunan data seismik iaitu amplitud relatif, ‘AGC’ dan ‘a crooked’ dikenakan perubahan sifat segera. Hasil menunjukkan bahwa perbezaan yang ketara diantara frekuensi yang tinggi dan rendah di kawasan yang cetek dan dalam berturutan dengan menggunakan jenis amplitud relatif pasca-timbunan seismik. Untuk data jenis ‘AGC’ pasca-timbunan seismik, frekuensi menunjukkan persembahan yang kurang memuaskan dan untuk data jenis satu liku seismik pasca-timbunan, frekuensi yang menunjukkan tinggi

dipamerkan dengan lebih jelas dalam garisan lebih menegak. Amplitud yang menunjukkan timbul yang jelas terpapar di bahagian dalam lebih baik dengan menggunakan data jenis peningkatan otomatik yang dikuasai pasca-timbunan seismik dan demonstrasi lapisan strata boleh dilihat dengan jelas melalui aplikasi fasa segera.

APPLICATION OF SEISMIC ATTRIBUTES TECHNIQUE TO POST-STACK SEISMIC DATA FOR STRUCTURAL MODEL DELINEATION

ABSTRACT

Normal post-stacked seismic sections sometimes hide important information. Efforts have over the years to enhance the readability of the seismic sections using seismic attributes. Various seismic attributes are currently active usage in the oil and gas industry. In the present study, post-stacked seismic attributes are used. Among the long list of such attributes, three attributes are chosen for this study are instantaneous frequency, instantaneous amplitude and instantaneous phase. The good performance for the instantaneous frequency attribute filter on post-stacked data rely on frequency bands chosen. It is noted that different rock formations have different frequencies. Hence, choosing different frequency bands can help increase the resolution on the post-stacked seismic sections. The main objectives of this study are to identify the narrow-band frequency for enhancing delineation the target formation and to analyze the reaction of sets of post-stack seismic data. To reach the objectives, the narrow-band frequency was extracted out from full-range frequency. Three types of post-stack seismic data; relative amplitude, automatic gain control and a crooked were applied selected instantaneous attributes. The result shows that reliable contrast of the high and low frequency at shallow and deeper part respectively by using relative amplitude type post-stack seismic. For automatic gain control post-stack seismic data, the frequency is in poor appearance and for a seismic crooked type post-stack seismic data, the high frequency vertical lines are obvious exposed. The boosting up amplitude at deeper depth is better raised by using automatic gain

control post-stack seismic data type and the demonstration of the stratigraphy layer can be seen by applying instantaneous phase.

CHAPTER 1

INTRODUCTION

1.1 Preface

Seismic image is a time picture that delineation the mimic subsurface of the earth. The seismic image is a seismic data produced from seismic survey where seismic survey is one of the geophysical methods to study the earth. Seismic survey can be run at onshore and offshore. During the seismic survey, the echo from active and passive source is recorded by geophone and hydrophone known seismic data. Seismic data will pass through processing stage to be seismic image for seismic interpretation.

Seismic image can show mainly the geology stratigraphy and the structure; for example, fault (Figure 1.1) and reservoir characterization (Figure 1.2).

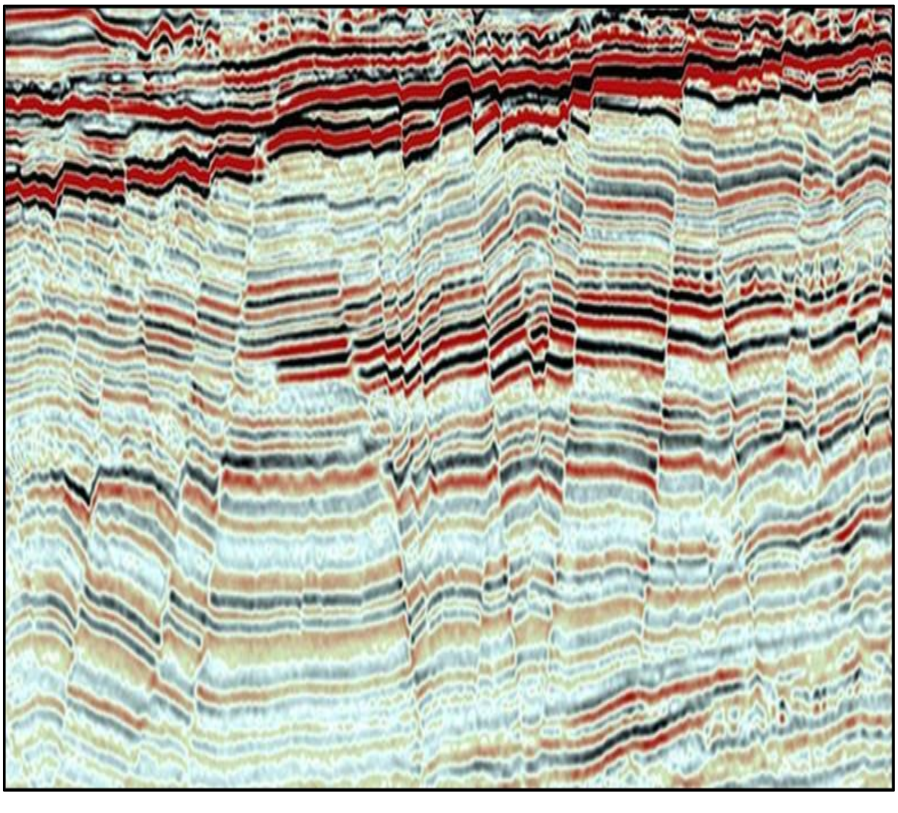

Figure 1.1 An example of fault on post-stack seismic data.

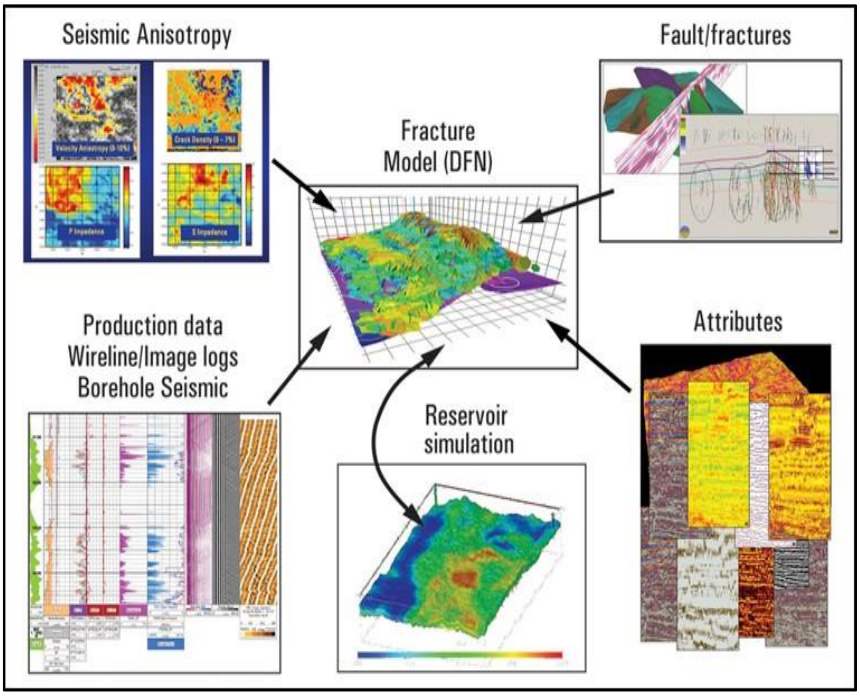

Figure 1.2 An example of reservoir characterization study.

In oil and gas industry, the information from the seismic image displays mimic oil and gas to be explored and produced for public demanding and daily consumption. On seismic data, the oil and gas can be signed by several patterns (Figure 1.3).

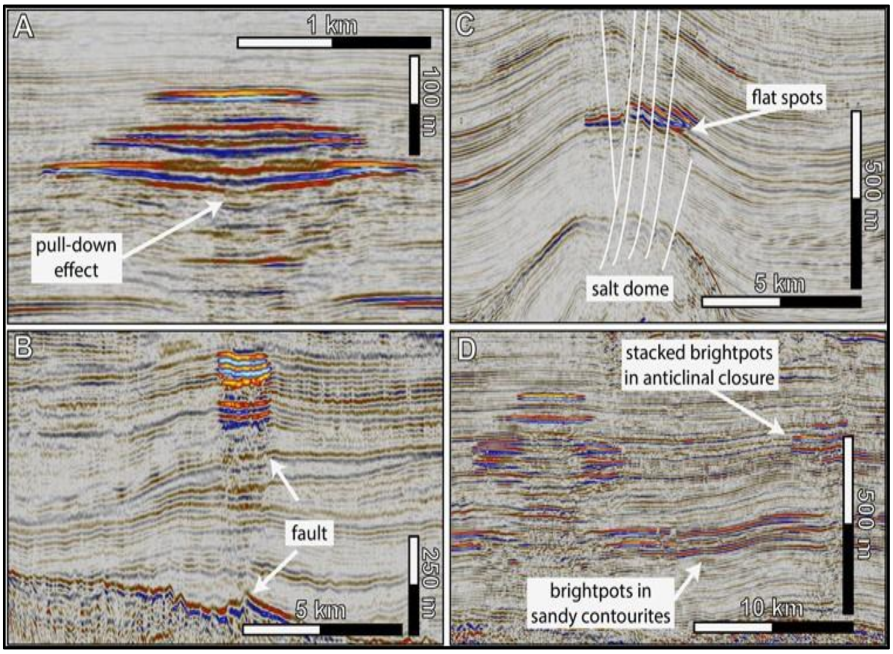

Figure 1.3 An example of oil and gas signature on seismic data

Seismic image can be further analyzed and one of the seismic analyzations is seismic attribute specifically instantaneous attribute. Instantaneous attributes have been derived from computation of complex trace analysis (Taner et al., 1979). This seismic attribute is operated to discard some parameters to reveal other parameter. Three subsets from seismic attributes that have been utilized in this study are instantaneous frequency, amplitude and phase (Figure 1.4).

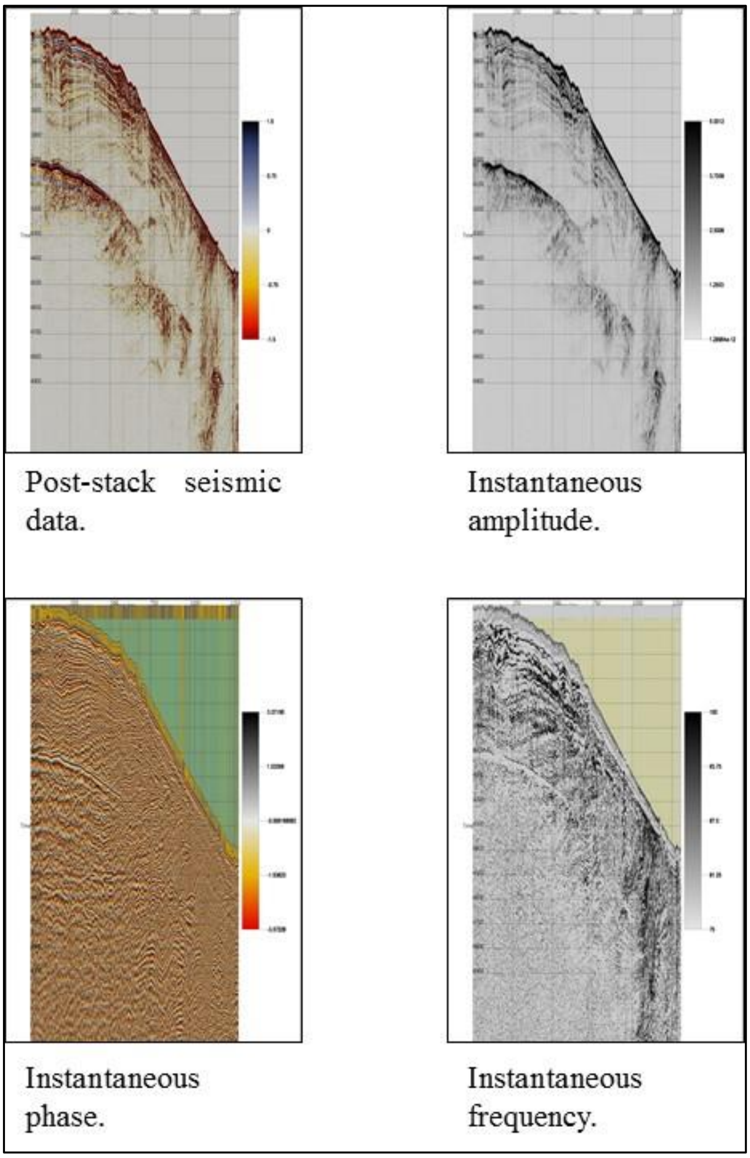

Figure 1.4 An example instantaneous seismic attribute analysis.

1.2 Problem statement

The information from the seismic image can be extracted through advanced analysis; seismic attribute. After the seismic image goes through selected instantaneous seismic attribute analysis; frequency, amplitude and phase, the seismic image should improve its presentation.

However, during frequency attributes application on seismic image in a full-range, the seismic image could not appear clearly. The different sets of seismic images also influence the result of application of seismic attributes.

In this study, the three types of post-stack seismic data will be analyzed by application of selected instantaneous attribute; frequency, amplitude and phase.

To tackle such situation, the narrow-band frequency of frequency attribute is identified and the response of sets of post-stack seismic data are analyzed and studied.

1.3 Objectives

This study has two objectives to be alarmed:

I. First objective is to identify the narrow-band of frequency for enhancing delineation of frequency pattern mimics geological subsurface image through instantaneous frequency attribute.

II. Second objective is to analyze the reaction of sets of post stack seismic data with application of instantaneous amplitude and instantaneous phase.

1.4 Significance of the research

This present study shows that the enhancing of the resolution of geological subsurface image can be achieved by taken care during displaying the result of the advanced analysis, instantaneous frequency and presentation of the effect of sets of post stack seismic data on selected instantaneous seismic attribute. For instance, testing the different sets of post stack seismic data and identifying narrow-band of instantaneous frequency reading for image improvement. The result shows the advancement of extracting the narrow-band of frequency can enhance the result and depicts the acceptable result while an incredible response of application instantaneous amplitude and instantaneous frequency from the diversity of post stack seismic data.

1.5 Structure of this study

This thesis is subdivided into five chapters. In a second chapter, the demonstration in short sentences of previous research is highlighted to demonstrate the importance of the present study.

For chapter three, methodology and procedures used in the study will be illustrated. The expected effects on the seismic data display will also be discussed. Furthermore, the application to the data will be presented at the end of the chapter.

A detailed discussion of the results produced from this study is shown in chapter four. The discussion shall illustrate the improvement to the seismic data when seismic attribute filter is applied. A discussion on the limitations and artefacts of the effect of seismic attributes on seismic data will also be presented. Finally, in chapter five, the conclusion of this thesis and suggestion for future work are in this last chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Producing high resolution seismic image is important task for optimization the seismic interpretation. In this direction, bundle of researches work has been conducted.

Conventional seismic enhancement technique is a routine technique which seismic data passes through processing stage in producing post-stack seismic image. For instant, common-mid-point (CMP), stacking and migration are the examples of conventional seismic enhancement techniques. Main target of this routine is to optimize the seismic signal and to minimize the noise by denoise and demultiplex.

However, this conventional technique has capability to yield poor appearance and minimize the resolution of seismic image.

Hence for that, due to demand maximizing the resolution of seismic data, effort for advanced seismic analyzation; focusing seismic attributes have been introduced. The response of the application is quite impressive.

In next paragraph are the compiling literature reviewed by years since the realization the important of the usage the seismic attribute alone and integrates it with other techniques.

2.2 Short Reviewed of Previous Research

(Simin, 1997), (Hesthammer et al., 1997), (Hou et al., 2008), (Oluwatosin et al., 2010), (Rezvandehy et al., 2011), (Ajisafe et al., 2013), (Mohebian et al., 2013), (Alao et al., 2014), (Koson et al., 2014), (Ngoc et al., 2014), (Naseer et al., 2014), (Odoh et al., 2014), (Farfour et al., 2015), (Kim et al., 2015), (L. Zhang et al., 2015), (Gnapragasan et al., 2016), (Riazi et al., 2016) and (Jamaludin et al., 2016), they have researched and included seismic attributes in their work. Those researchers have their own unique objectives and been storied in detail in next paragraph either standalone or integration with other method of application of seismic attributes and the software that has been used in this study also been summarized in shortly.

Due to that, after deeply the seismic data went through the application specifically instantaneous frequency seismic attribute, the result showed unacceptable for further seismic interpretation. Therefore, this study extracted narrow instantaneous frequency to be utilized to produce reliable seismic image and the methodology was stated in Chapter three.

Without hesitation, previous research is going to be storied one by one with their objective, method and result using seismic attribute and begun from Simin, 1997, wanted to identify the zone of interest, interpret the main reflector, tie compressional, converted and pure shear wave using the application seismic attribute in mapping dolomite reservoir and to analyze signal to noise ratio (S/N) in different components dataset to reveal extra details information compared to P-wave data through calculating frequency spectra by FXTRAN and MATLAB. Four types datasets; P-P stack, P-SV stack, SH-SH stack and P-SH stack (Figure 2.1) were used for seismic attribute analysis. Instantaneous amplitude results showed to dim with increased porosity but increases inside the reservoir. Continuity in tight low porosity carbonate was revealed by instantaneous frequency. Study the frequency and phase of four types datasets by FXTRAN presented that loss of frequency and consistent phase.

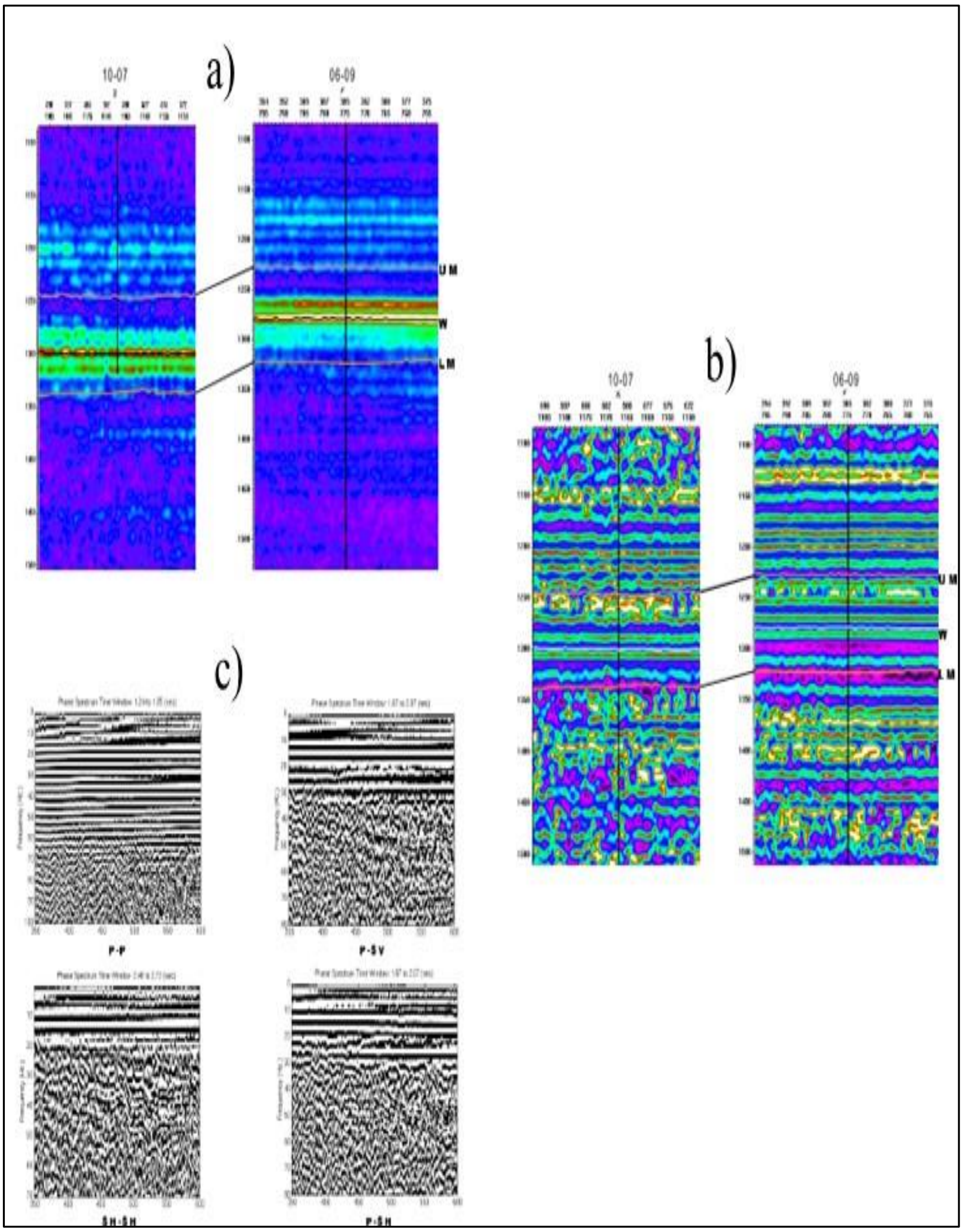

Figure 2.1 a) P-P Instantaneous amplitude b) P-P Instantaneous frequency and c) Frequency and phase spectra for P-P, P-SV, SH-SH and P-SV (Simin, 1997).

Hesthammer and Fossen, 1997 got problem to distinguish between anomalies related to real geological features and seismic noise and mapping structural like fault on seismic data. Seismic attribute was used to overcome the problems such as dip, relief, amplitude and azimuth attributes map that applied on the existing seismic 3D dataset of the Gullfaks. Core data, dipmeter data, stratigraphic log correlation and forward modelling. Method Core data, dipmeter data, stratigraphic log correlation and forward modelling, seismic attribute map: Dip, relief, azimuth and amplitude maps (Figure 2.2). Filtering appropriate use of colours and light sources. seismic attribute mapping became more important for recognizing small-scale structures (such as faults with offsets of less than 20–30 m and drag structures), but also helped with the interpretation and understanding. Result The new maps show no such anomalies, but more even distribution of faults indicates a more realistic interpretation seismic attribute maps that have proven useful for structural analysis.

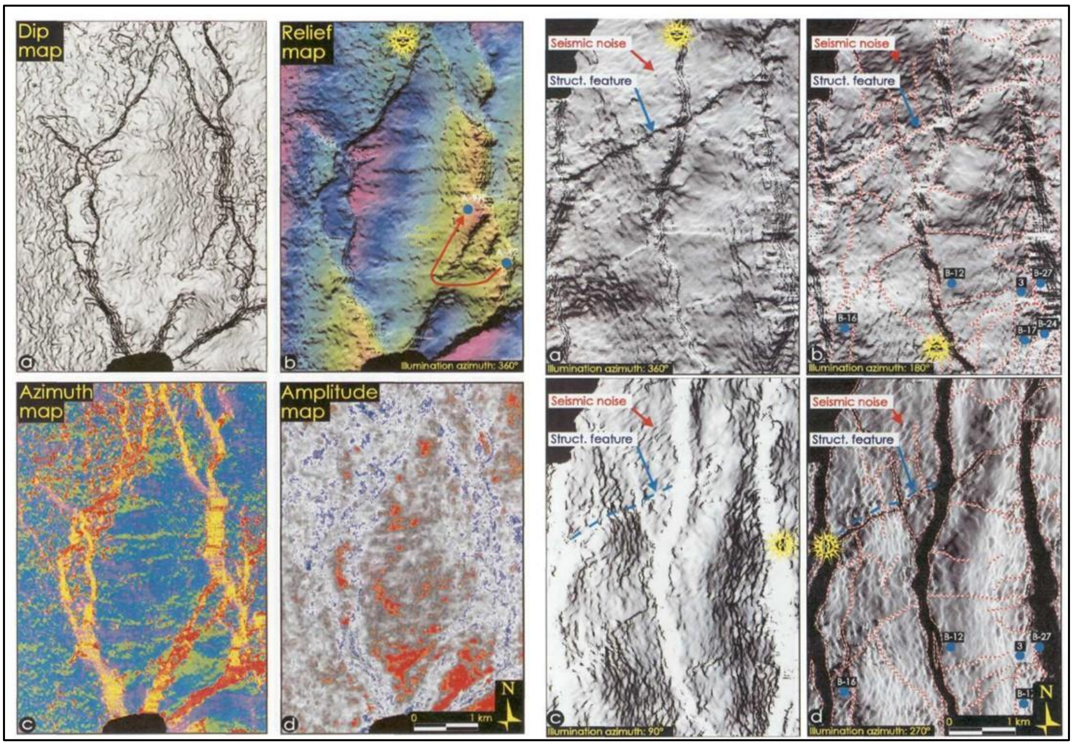

Figure 2.2 Result of application seismic attribute (Hesthammer et al., 1997).

Hou *et al.*, 2008 found problem the distributions of the sandstone layers, e.g. thickness, porosity, remain unclear across the area because there are only few wells drilled. To predict the distribution of sand probability within the main reservoir horizons it applied Geology Driven Integration Tool, artificial neural network, Monte Carlo simulation and seismic attributes (Figure 2.3). Integration these techniques were an effective method in the prediction of distributions of rock properties, especially when factual well data are few or too concentrated so that it is difficult to understand the distributions by conventional method.

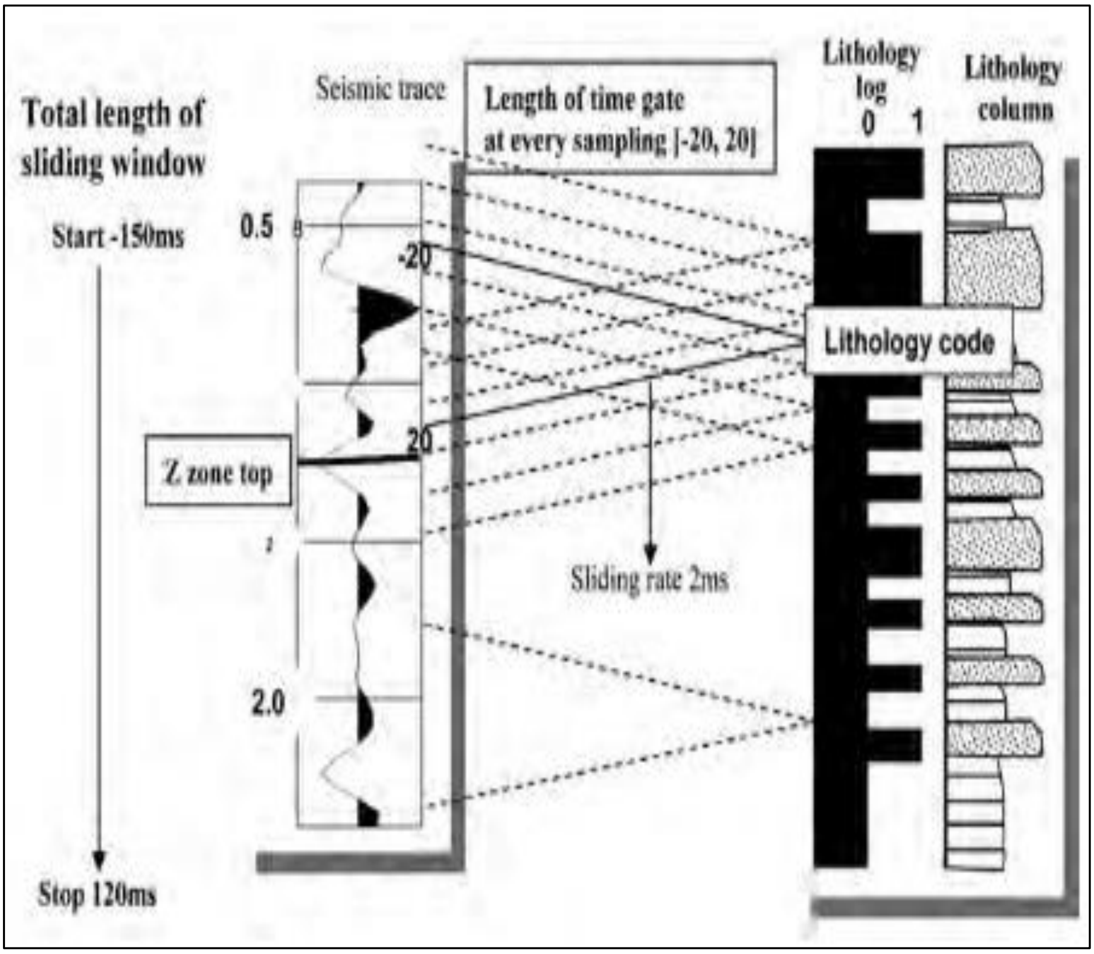

Figure 2.3 Lithology extraction from pseudo wells and seismic attributes (Hou et al., 2008).

Oluwatosin *et al.*, 2010 found out the feasibility of integrating structural interpretation and instantaneous amplitude (Figure 2.4) in prospect identification and reservoir prediction. 3D seismic data was used. The idea of utilizing amplitude for the analysis is from the assumption that lithology, rock properties and fluid content should affect seismic characteristic. Result showed bright spot reflections were observed as horizon tracking continued by amplitude map interpretation.

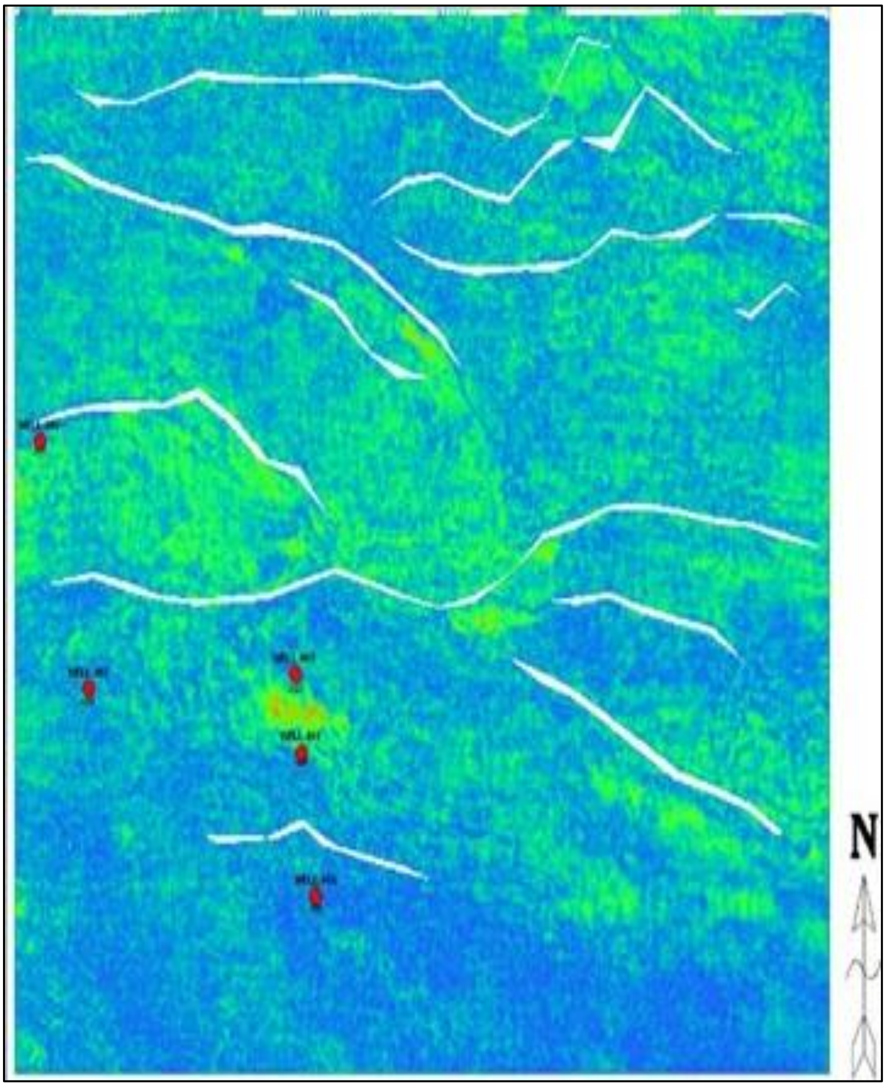

Figure 2.4 Instantaneous amplitude map (Oluwatosin et al., 2010).

Rezvandehy *et al.*, 2011 found three dimensional seismic operation of Gorgan Plain was studied around a well, which is situated in North of Iran following the hitting of a thin overpressure gas layer (thickness of 9.6m), with the purpose of the accurate modeling of geological structures and determining the approximate gas storages estimate the thickness of gas layer in the 3D seismic volume and determining the gas storage, the thickness changes based on the seismic amplitudes were used because its thickness was less than the critical resolution thickness for this layer. However, due to its low thickness, the lack of indicator peak in seismic sections and strong faults of area, it was difficult to pursue this layer in the seismic volume and map its exact amplitude. To demonstrate the shape and volume of the existing structural traps in the studied area. Method First, the instantaneous amplitude attribute of the thin reservoir layer reflector in computed synthetic seismogram were fabricated and then the frequency regarding the highest amount (dominant frequency) was chosen by Fourier Transform. Finally, spectral decomposition (FFT) with the resulting frequency was gained over the cross-section of the layer's instantaneous amplitude attribute in the 3D seismic volume choosing a proper time window. Finally, spectral decomposition (FFT) with the resulting frequency was gained over the cross-section of the layer's instantaneous amplitude attribute in the 3D seismic volume choosing a proper time window. Result an increase of its thickness was its amplitude increase and the minimum gas storage of this reservoir was calculated using the area of the restricted part of high thickness (over 9.6m).

Ajisafe and Ako, 2013 characterized reservoir of “Y”. Method integration using quantitative seismic attributes and petrophysical properties. 3-D seismic sections (Figure 2.5), composite well logs and check-shot data were used. Result presented seismic attribute maps revealed presence of hydrocarbons in the identified sands. There was a good correlation between the structural high and zones of anomalous amplitude. It was concluded that seismic attributes could be used to predict reservoir rock properties and characterize reservoir. Attribute maps such as amplitude (maximum and RMS) (Figure 2.6) and relative acoustic impedance were also extracted to complement the structural maps. There is a strong relationship between the maps as the structural high coincided with zones of anomalous amplitude. Seismic attributes display maps reveals outstandingly strong reflection (bright spots) which may be indicative of reservoir rocks due to the presence of hydrocarbons in the identified sand. The integration of seismic amplitude and well properties, gave optimally located well platforms. Seismic attribute analysis has been used successfully in this research work to predict reservoir rock properties, characterize reservoir sand quantitatively, which can lead to optimally selected drilling location of development wells in "Y" Field. It is cost effective.

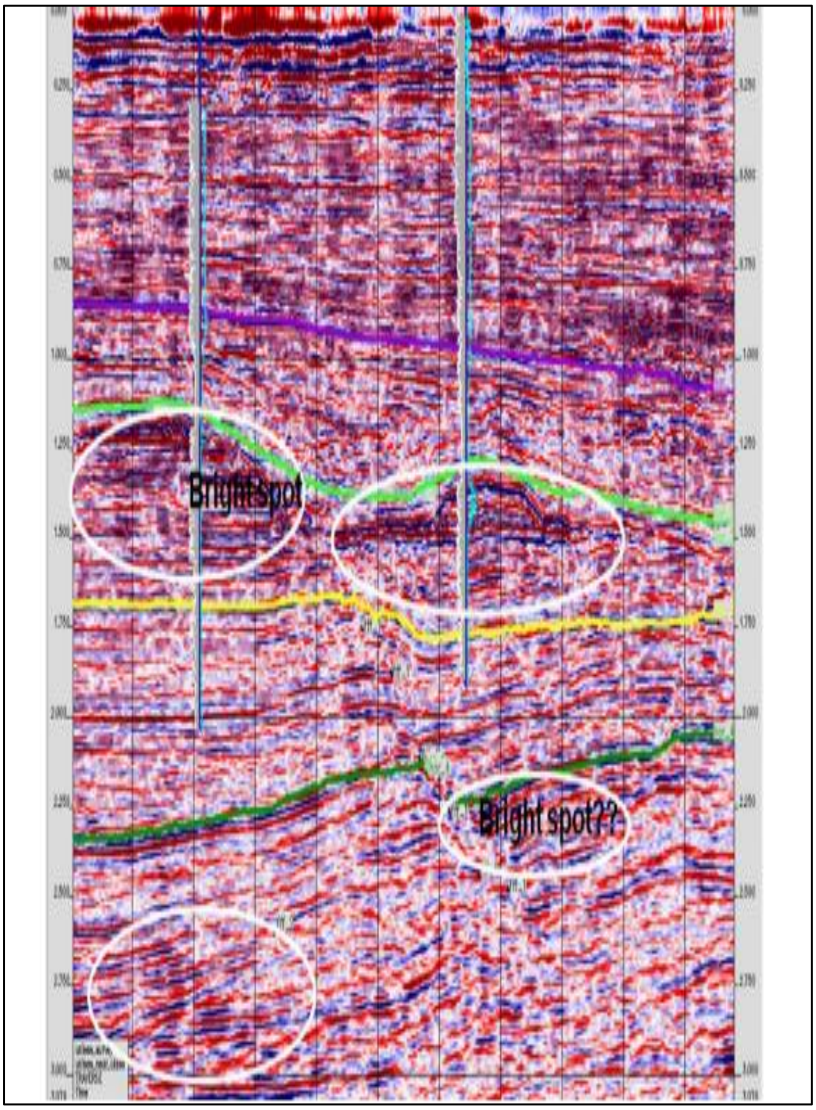

Figure 2.5 Detection bright spot on seismic data as hydrocarbon indicator (Ajisafe et al., 2013).

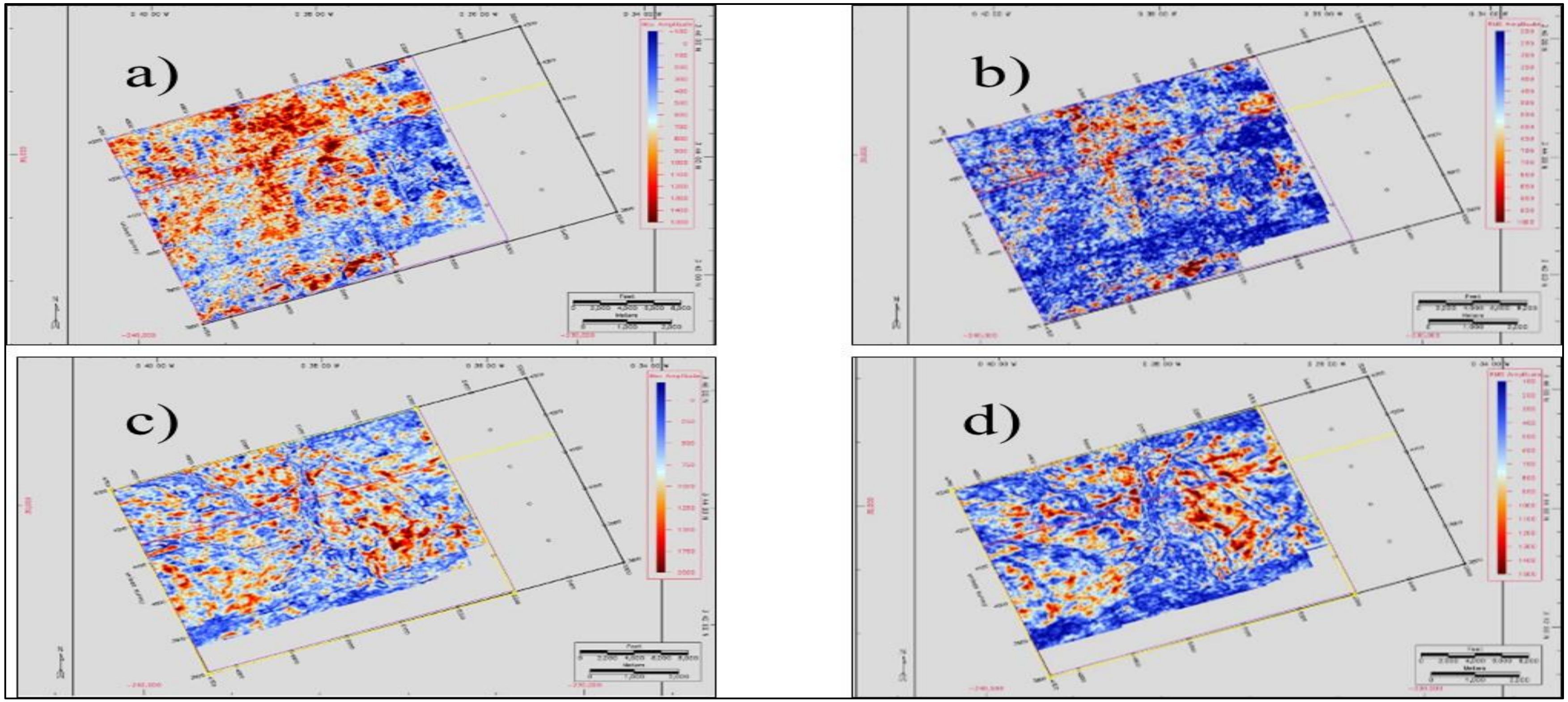

Figure 2.6 a) Maximum amplitude attribute map of horizon 2. b) RMS amplitude attribute map of horizon 2. C) Maximum amplitude attribute of horizon 4. D) RMS amplitude attribute map of horizon 4(Ajisafe et al., 2013).

Mohebian *et al.*, 2013 detected the channels (Figure 2.7) in one of the SW Iran oil fields. Instantaneous spectral attributes are used as a robust tool to describe the frequency-dependent characteristics of stratigraphic events (Figure 2.8). Spectrograms are derived from spectral decomposition methods such as Short-Time Fourier Transforms (STFT), S-transform and Matching Pursuit Decomposition (MPD). STFT requires a predefined time window, which causes reduction of the time-frequency resolution. S-transform has better time-frequency resolution than STFT due to use of a varying-frequency window. Since MPD uses an iteration algorithm, so it is expected that instantaneous spectral attributes obtained from MPD have better time-frequency resolution than those from the other methods, though the iteration algorithm increases the time of computation in MPD. Instantaneous spectral attributes such as centre frequency and bandwidth are extracted from the time-frequency maps (spectrogram). These attributes are useful tools in interpretation of stratigraphic phenomena and detection of some geological events which normally cannot be observed in the conventional seismic sections, as river- buried channels.

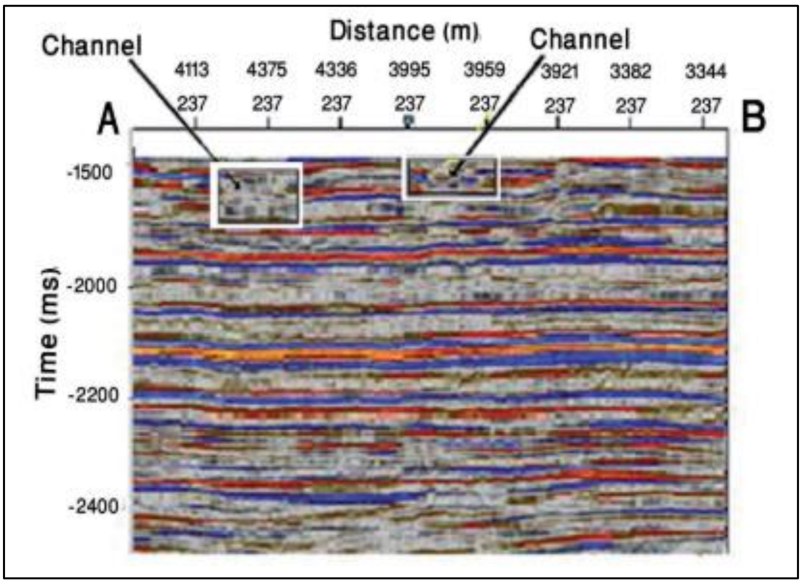

Figure 2.7 Two channels (Mohebian et al., 2013).

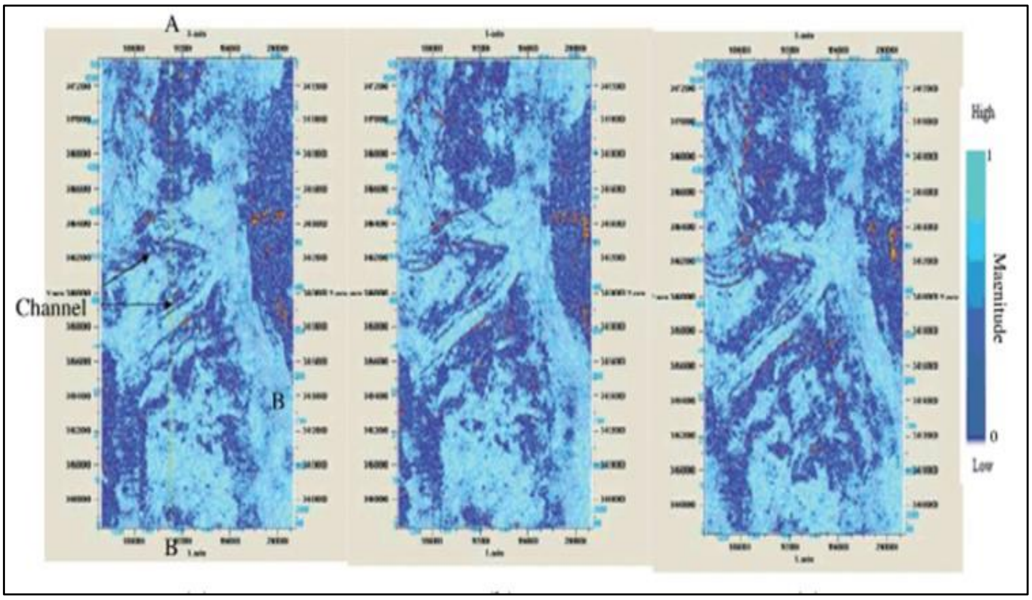

Figure 2.8 Cross section at a) 20Hz b) 40Hz c) 60Hz shows channel

Alao *et al.*, 2014 integrated three-dimensional (3-D) seismic attributes and log data to determine rock property and provided a better understanding of the complexity. Method was used was Physical Attributes such envelope phase and Geometric Attributes. The envelope attribute is of importance detecting bright spots caused by gas accumulations, detecting major lithological changes that are caused by strong energy reflections and sequence boundaries (Figure 2.9).

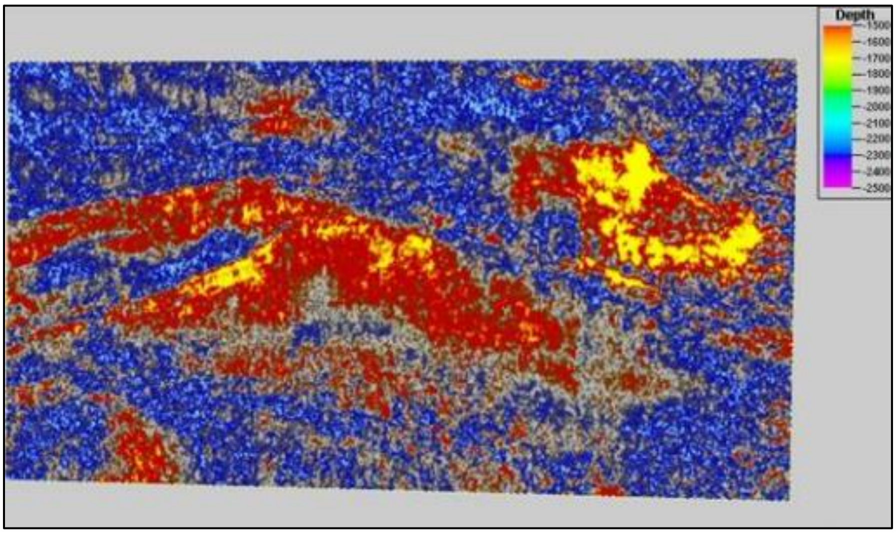

Figure 2.9 Bright spots due to hydrocarbon (Alao et al., 2014).

Koson *et al.*, 2014 used envelope, rms amplitude, sweetness, chaos attribute and spectral decomposition for seismic geomorphology where the structure such as faults and fractures are displayed well (Figure 2.10). Problem hidden in the data and have been used to identify prospects, ascertain depositional environments. Objectives to review and introduce some seismic attributes for seismic geomorphology. To provide geoscientists with the minimum required theory of how each attribute is generated and to understand the seismic attribute application at basic stage. Method that has been used: Envelope attribute, Root Mean Square (RMS) Amplitude, RMS, Local Structural Dip, Structural Sweetness, Variance Attribute, Chaos Attribute and Spectral Decomposition (Figure 2.11).

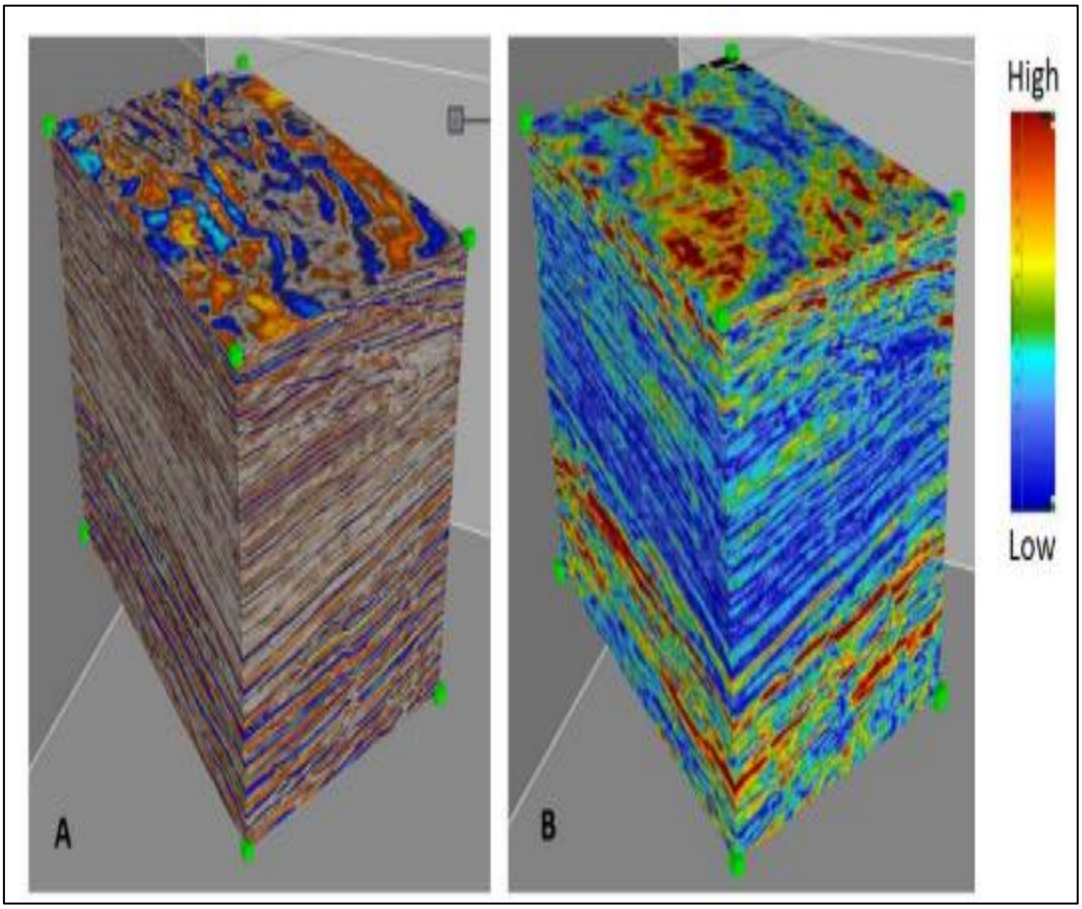

Figure 2.10 a)original b) envelope attribute (Koson et al., 2014).

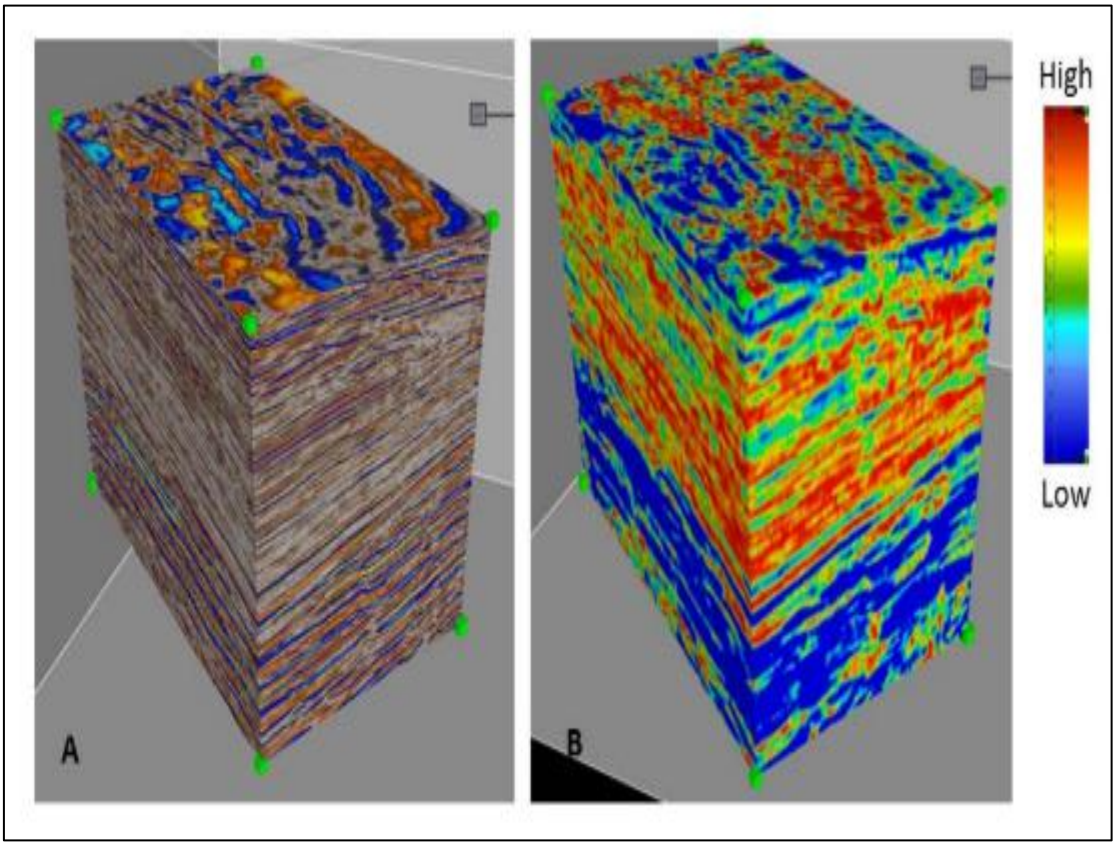

Figure 2.11 a)original b) sweetness attribute (Koson et al., 2014).

Ngoc *et al.*, 2014 applied amplitude, coherence, curvature, and secondary derivative attributes and the accuracy of fracture characterization based on seismic attributes has been verified by drilling results. Problem was the quality of the fractured basement reservoirs depends on basement rock type, fracture density, and fracture characteristics including aperture, azimuth, dip, continuity, and fracture system intersection. Objectives based on results from applying many different seismic attributes to 3D seismic data from different Pre-Tertiary fractured basements in Vietnam and Malaysia, we demonstrate the utility of attributes in characterizing fractured basement reservoirs. Result Seismic attributes help predict the basement rock type and fracture characteristics from near top basement to deep inside basement. In the zone near the top of basement, the characteristics of fracture systems can be predicted by amplitude, coherence, curvature, and secondary derivative attributes.

Deep inside the basement, relative acoustic impedance and its attributes have been successfully applied to predict the distribution of high fracture density, while dip and azimuth, ant-tracking, and gradient magnitude attributes have proven to be effective for predicting fracture characteristics. The accuracy of fracture characterization based on seismic attributes has been verified by drilling results

Naseer *et al.*, 2014 utilized coherency and frequency attributes for lithological discrimination such as channel delineation and geometrical analysis. Objectives to exploit the channel reservoirs and other stratigraphic features in such a terrain where there is always a challenge for the geoscientist to search and exploit the channel reservoirsData high resolution 3D-seismic data. Method we have utilized attribute analysis. Result coherency, frequency (are also appropriate for lithological discrimination), which are sensitive to the channel edges are applied for the channel delineation and their geometrical analysis. Spectral decomposition techniques are also applied for the delineation of channels and to appropriately select the best band for channels identification. Three types of channel geometries are recognized: 1) highly sinuous channel; 2) narrow-broad meandering belts; 3) moderate to high sinuous channel. NW-SE, N-W trending faults can be helpful to compartmentalize the reservoir. Instantaneous and dominant frequency are more beneficial for further field development based on Gamma Ray logs from nearby drilled wells and dimensional perspectives analysis of the channel reservoir.

Odoh *et al.*, 2014 similarity and curvature attributes were calculated on the dip-steered and fault enhanced volume (Figure 2.12). The results of attributes present detailed geometry of the fault system and the numerous subtle lineaments in the study area.

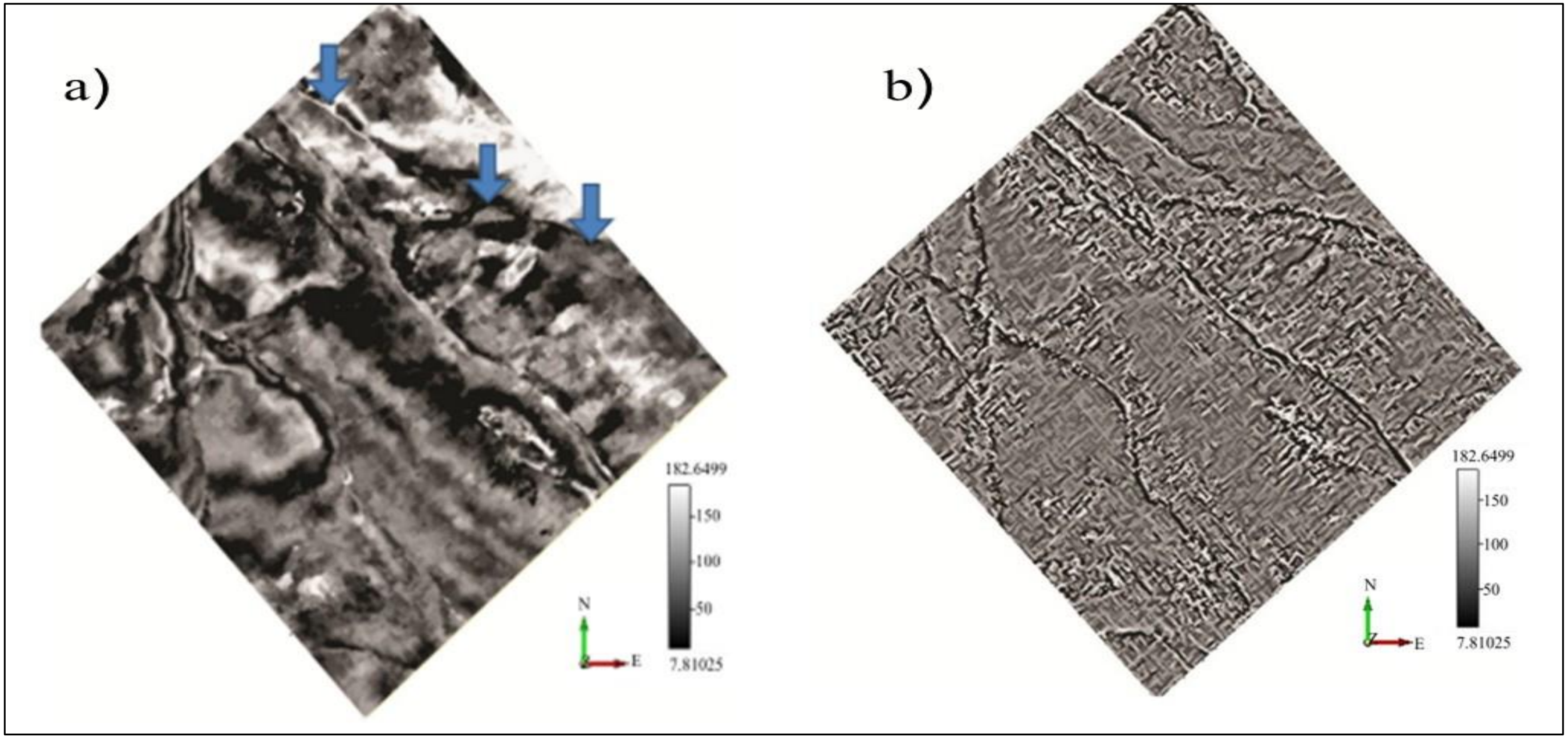

Figure 2.12 a)Dip-steered attribute. B)Maximum curvature attribute (Odoh et al., 2014).

Farfour *et al.*, 2015 integrated between seismic attribute and seismic inversion in their study. Amplitude, phase, and frequency attributes were applied to infer seismic expressions of the reservoir and the limestone formations and spectral decomposition is performed to study the frequency responses of the different lithotypes. the attribute images and frequency maps could distinguish between the different investigated units. The cosine of instantaneous phase attribute along with impedance sections supports the above interpretations extract more key information about challenging reservoirs with less ambiguity. Problem to study a challenging reservoir facies from Boonsville field in north central Texas. Two thin reservoirs, Upper Caddo and Lower Caddo, separated by a non-productive thin limestone formation are investigated. Wells drilled on interpreted doublet reflections turned out to dry holes penetrating two thin limestone units instead. Objectives to interpret of complex hydrocarbon reservoir. Method seismic attribute and acoustic impedance inversion. First, some modern poststack processing techniques are used to remove incoherent noise and improve the data resolution and interpretability. Seismic instantaneous attributes (i.e., amplitude, phase, and frequency) are then calculated to infer seismic expressions of the reservoir and the limestone formations. Next, spectral decomposition is performed to study the frequency responses of the different lithotypes. Interestingly, the attribute images and frequency maps could distinguish between the different investigated units.

Kim *et al.*, 2015 came out with the reflection strength shows high and instantaneous frequency decreases sharply below the gas hydrate zone. Whereas, if gas hydrate occurs without free gas, reflection strength is low and instantaneous frequency is high continuously below the gas hydrate zone. Objectives is to indicate gas hydrate using 3D seismic data (Figure 2.13). The methodology that has been used: seismic attribute analysis; Reflection strength, Instantaneous frequency and spectral decomposition (Figure 2.14).

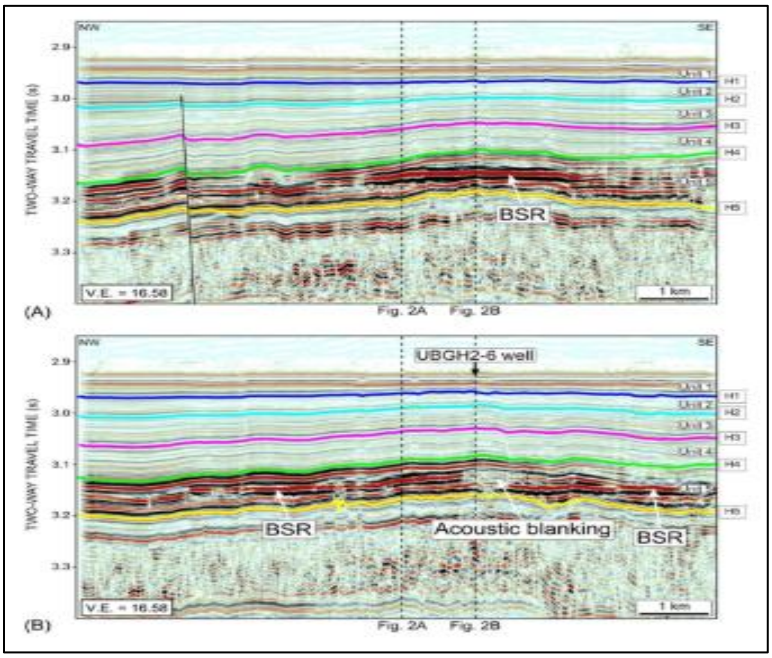

Figure 2.13 a) and b) are stack seismic data shows acoustic blanking (Kim et al., 2015).

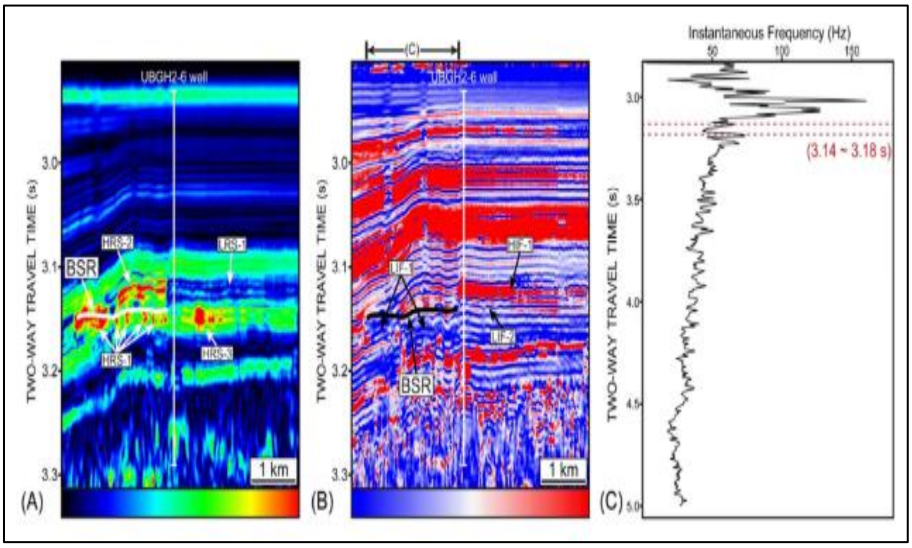

Figure 2.14 The results of seismic attribute a) Reflection strength b) Instantaneous frequency c) Vertical distribution chart of instantaneous frequency (Kim et al., 2015).

Zhang *et al.*, 2015 practiced instantaneous frequency attribute of seismic waves that can describe the reservoir distribution qualitatively in unconsolidated heavy oil sands, instead of wave impedance inversion attribute. Objectives identify the seismic attributes which are sensitive to heavy oil reservoirs, and then extend these results to the widely qualitative reservoir prediction in the whole area. Data;2-D seismic lines Additionally, there is about 37 km2 of 3-D seismic survey acquired inside the study area. Because the 2-D line spacing is large, there is substantial distance between the well locations and seismic lines.

Gnapragasan *et al.*, 2016 used spectral decomposition attribute which was created simply by changing the time seismic into frequency domain using Fourier analysis that cross correlate between predefined sinus and cosines frequencies and as a tool in recognizing subtle features in more detail specially of the stratigraphic features such as channels, valleys, deltas and so on. Problem Alluvial deposit is considered to be one of the biggest hosts of the petroleum entrapment and also for many non renewable resources. Objectives to discuss on how spectral decomposition method could be used to enhance geological features of the Taranaki basin emphasizing on stacking channels that widely seen most part of the area. Data post stack time migrated data. Method spectral decomposition.

Riazi and Clarkson, 2016 applied acoustic impedance that one of the attributes which was extracted by model-based inversion. Low values of acoustic impedance correlate well with strong inter-well connectivity. Well log analysis demonstrates a correlation between acoustic impedance and porosity. Objectives reservoir characterisation and study inter-well connectivity studied of tight oil reservoirs. It used seismic data and the method was seismic attribute.

Jamaludin *et al.*, 2016 utilized chaos, variance-coherence and local structural dip attribute are helpful in detecting unique responses caused by the gas presence, as well as improved the interpretation in the affected area. Objectives In order for us to get familiar with the existence of gas seepage on seismic data, we need to know their characteristics and how do they look like. The study utilized seismic data. Result detailed observation of the seismic data affected by gas leakage shows that the top of the gas leakage always exhibits bright amplitude with notable wipe-out zone within the gas chamber. The seismic reflections within the gas seepage also gives chaotic reflection and give difficulties in interpreting the structure within the gas seepage. Use of seismic attributes in characterizing the gas seepage is also presented in this paper as an aid to improve the interpretation in the area/zone affected by the seepage.

The software Opendtect was used by Louie *et al.*, 2013 to compute seismic attributes and by Schneider, 2017 to display the seismic profile analyzation.

2.3 Chapter summary

The literature reviewed in this study defines the problem and offers variety of solutions. The problem pushes out the idea to find a way to achieve the presentation more meaningful.