Conceptual interpretation seismic 3d using rms amplitude and dip-azimuth attribute analysis for identification structure and facies model in physical geographic

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Abstract Interpretation of seismic 3D data using attributes analysis to determine the condition of the subsurface geology and distribution facies as physical geography study. The results of interpretation formed surface horizon analysis of structures located in the southwest (SW) is the high of the continuous anticline to the northeast (NE) and the structure of the valley are in the south (S) continuously until the northeast (NE). From the results of the RMS amplitude attribute map shows that high amplitude anomalies uneven section southwest (SW). Show areas indicated as coal facies deployment area and assuming a low impedance possibility for the existence of coal facies. The map dip, azimuth, dip-azimuth can be analyzed map depicts stance or azimuth direction and dip (slope) time domain structure with angle pattern shown seismic trace with section 4501 and the arbitrary line a - b and line c - d clarify seen a pattern of fractures (faults) on a small scale where the direction nearly perpendicular to the strike of major fault.

1. Introduction
Based of applied geophysics method is exploration geophysics especially used seismic method required of good understanding of math and physics principles, geology and physical geography knowledge, with determine the best data acquisition parameters to collect data according to various physical properties of geological settings, after that using effective algorithm extraction information data to be analysis with geological condition and interpretation about existences, locations, sizes and ranges of target interest [12]. Doing interpretation of seismic 3D data using attributes analysis to determine the condition of the subsurface geology and distribution facies as physical geography study. Basically, attribute amplitudes used in this study is more widely used to show the spread of facies coal structures that affect the field of pearls [3].

Interpretation from results of dip, azimuth, dip-azimuth map can be analyzed map depicts the moment direction or azimuth and dip (slope) time domain structure with angle pattern shown in the color scale degradation [6]. Map azimuth can indications of a pattern of small-scale faults which strike direction nearly perpendicular to the major fault.

2. Methods
Stage aims to translate the interpretation of seismic data into a geological sense and term of physic geography. At this stage, the output of the processing stage can be directly interpreted or processed further to facilitate of interpretation often called advance processing [4]. Several methods are commonly used in advanced seismic processing is a method of attributes, AVO and inversion [3].

2.1. Seismic Attributes
Seismic attribute is a mathematical transformation of the data presented trace seismic magnitude the time, amplitude, phase, frequency, and attenuation [8]. Seismic attributes are also expressed as a quantitative and descriptive nature of the seismic data can be displayed in the same scale as the original.
data [3]. Each of these attributes relate to each other, where some attributes have a particular sensitivity to the nature of the reservoir and several other attributes better in presenting information or subsurface anomalies were not initially identified by the conventional data or materials as an indicator of the presence of hydrocarbons (direct hydrocarbon indicator) [1].

2.2. Attribute amplitude (Amplitude attribute)
Amplitude is the most basic attributes of seismic tras. Initially, interest interpreters interested in limited amplitude feature, not the magnitude, because in the beginning of seismic data are only used for structural analysis [7]. Currently, seismic data processing is generally intended to get "preserve or true amplitude" stratigraphic analysis to do so [8]. Lateral amplitude changes are used in these studies to distinguish the facies with other facies. For example, generally concordant layers will have a higher amplitude, "hummocky" a little lower and "chaotic" lowest. So basically, attribute amplitudes used in this study is more widely used to show the spread of facies coal structures that affect the field of pearls [6].

2.3. RMS amplitude attribute (RMS amplitude attribute)
The amplitude root mean square is the square root of the average of the squared amplitude within a certain time interval. Since the amplitude squared before averaged, then computing root mean square would be sensitive to changes in the amplitude is quite large or small [10].

\[
Amp_{-RMS} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} Amp^2}
\] 

(1)

2.4. Directional Dip and Azimuth Attributes
The principle of the inclination and azimuth calculation is quite simple and is done by matching a plane through the points related data and display the calculated values at the center of the data points as in Figure 1. Below.

![Figure 1. Counting Principles dip and azimuth][2]

Basically, dip and azimuth are the magnitude and direction of the gradient vector of time, from the local reference, which is calculated at each sample horizon are interpreted. Slope value is expressed as degrees or radians, or more often as milliseconds per meter. Elevation and azimuth are usually displayed on a different map [11]. The maps should be studied separately, because the faults-faults that will affect the mapped horizon do not appear as clear on the second map. A fault will be clearly defined on the map azimuth when the direction opposite to the slope of the layer fault, otherwise would not clear when the direction of the slope of the fault together with the layer field. A section to be imaged clearly on display tilt, when the tilt angle of the fault plane is different from the slope of the layers and otherwise poorly imaged when the tilt angle is almost the same as the field layer. Imaging fault "hidden" is a major impact on the development of strategies related field. Fault-fault those that have a "throw" of less than 10 m, so it is not imaging clearly on a map of the structure of time, is a fault-shear fault which causes the formation of solid reservoir / tights [9]. Fault-fault also caused the reservoir compartmentalization and differences OWC on wells in the area. Amplitude data corresponding to the direction of dip the seismic event. Dip is very useful to be able to see any indication of fault structures form. And amplitude data corresponding to the azimuth of the direction of maximum dip seismic display.
Construction is the amplitude of the data using a combination of dip and azimuth of her, which makes it possible to make the surface become clearer in describing the structure (such as fault, channel, etc.) depending on the direction of the lighting source. Position control lighting sources throughout the structure is very important to meet a clear view of the surface map. Seismic attributes play a role in contributing to identify the appearance of small-scale structures that have important element in reservoir characteristics [6].

3. Results and Discussion

3.1. Framework of Study Analysis for Subsurface Mapping
From beginning using the geophysics application interpretation seismic software integrated with workstation for better in big data storage support for seismic data and can collect more than thousand well data with high capacities and workflow consist of firstly loading data submit the well data, base map, check shot data, geological report include accurate coordinate data in geographic information system conversion [5]. How to use seismic data that varies in quality and vintage to predict geology between wells. Because seismic is acquired in time while geological and engineering data are in depth, maximizing data value requires a process for seamlessly integrating the various data into an accurate geologic model [10]. Well and seismic data in tie with digitizing process in picking horizon describe of layering subsurface of physical geographic condition, interpretation analysis had two model with time structure and attribute RMS amplitude to become facies model of coal with indicate as high amplitude value anomalies, and directional attribute produced structure model can be interpreted structure major and minor type [5].

![Diagram](image)

**Figure 2.** Workflow interpretation seismic using attribute analysis.

3.2. Time Structure Map
From the results of interpretation formed surface horizon and analysis structures located in the southwest (SW) is called the High or the continuous anticline to the northeast (NE) and the structure of the valley are in the south (S) continuously until the northeast (NE). Good contour with scale detail coloring facilitates the correct form of surface structure.
3.3. RMS amplitude attribute map
The results of the RMS amplitude attribute map in (figure 3) show that high amplitude anomalies uneven section southwest (SW). High amplitude area from green to white color is an area that is indicated as a spread coal facies area. High amplitude values due to the impedance contrast, assuming a low impedance possibility for the existence of coal facies.

3.4. Dip, Azimuth, Dip-Azimuth Map
Interpretation from results of dip, azimuth, dip-azimuth map can be analyzed map depicts the moment direction or azimuth and dip (slope) time domain structure with angle pattern shown in the color scale degradation. From figure 4 it can be seen on a map azimuth there are indications of a pattern of small-scale faults which strike direction nearly perpendicular to the major fault.

And the assumption is reinforced by comparing the map of the dip-azimuth allows surface becomes clearer from relegation lighting color scale in describing the structure of the fragments are small (fault shown in orange and blue lines).
Figure 5. The appearance of small-scale fault indication on the azimuth map and Dip-Azimuth Map (orange and blue lines).

For example, can be displayed on a cross section of arbitrary seismic line a – b and line c – d and 4501 trace a pattern that has a darker color uniformity constant lighting of the direction perpendicular to the major fault indication as small fragment. Figure 6 (left) is an arbitrary line a - b seems clear there are 2 pieces of fault zones interpreted as the interest of the same pattern found in figure 6 (right) arbitrary line c - d cross sections parallel to the direction to look continuous direction of the fracture is accompanied by a cross section line (example Trace 4501) which cut the track arbitrary line in order to get a better fracture patterns.

Figure 6. Fault structures in Arbitrary line a – b (left), c – d (middle), and Trace 4501 (right).

4. Conclusion

The results of interpretation formed surface horizon analysis of structures located in the southwest (SW) is the high of the continuous anticline to the northeast (NE) and the structure of the valley are in the south (S) continuously until the northeast (NE). Good contour with scale detail coloring facilitate the correct form of surface structure. RMS amplitude attribute map shows that high amplitude anomalies uneven section southwest (SW). High amplitude white areas are regions indicated as coal facies deployment area. High amplitude values due to the impedance contrast, assuming a low impedance possibilities for the existence of coal facies. The map dip, azimuth, dip-azimuth can be analyzed map depicts stance or azimuth direction and dip (slope) time domain structure with angle pattern shown in the color scale degradation. And from the map azimuth and dip-azimuth seismic trace with section 4501 and the arbitrary line a - b and line c - d clarify seen a pattern of fractures (faults) on a small scale where the direction nearly perpendicular to the strike of major fault.

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