IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 06, Issue 06 (June. 2016), ||V1|| PP 44-47

Application of Fault Identification Technology In Daqingzi Oilfield

Changming Ma[1], Mingxue Zhang[1]
[1](*College of Earth Sciences Institute , Northeast Petroleum University,Daqing, Heilongjiang , China,)*

Abstract: **-** Faults play an important role in the complex fault-block reservoir, fine fault interpretation and combination matter a lot. Aiming at the difficulty of the complex fracture system and fault interpretation, this paper bases on the union of wells and seismic data, and make full use of spectral decomposition, seismic curvature, coherence analysis and frequency mixing with 3 colors, then governs the whole interpretation with 3D structural model. With the use of various methods, we start to identify faults. This technique achieves a good effect in research area, especially for the small fault identifying, overcomes the lack of resolution in seismic data, increase the interpretation accuracy, find and delineate a batch of small faults, and guide the plane distribution and space intersection relation of faults, commit the regional low-amplitude structure, achieve the goal of fine structural interpretation.

Keywords: *- Faults recognition; Detailed interpretation; Coherence analysis technique; Fault identify*

I. INTRODUCTION

With Jilin oil field exploration broadening, the exploration targets have by looking for structural reservoirs gradually transition to looking for lithologic factors primarily difficult reservoirs, the exploration objects are mainly low amplitude structure, small fault block, small fault nose structure reservoir and hydrocarbon reservoirs is characterized by thin reservoir. The geological features of the exploration object is the difference in structure is small, distribution regularity, fast changes in reservoir lithology and distribution is not stable, thus become a bottleneck restricting the development of oil field. We make full use of 3 d seismic data and existing development pattern based on black top, green three paragraphs underside structure map detailed interpretation, a comprehensive understanding of work area and low amplitude structure, guide the next exploration deployment.

II. GEOLOGICAL SURVEY

Daqingzi well oilfield black 51-47 block is located in the southern Songliao basin in the central depression area in northern Changling sag, structure across the central fault belt, east, then, is the most complicated Daqingzi structure characteristics of the Wells (Fig 2). Three-dimensional seismic work area for collection in 2011, covers an area of 320 km2, contains 10 development zone, north to the black 47, south to black 51 the block, number of wells in the area of 1180, which the agent review well 51, is QianAn production plant is one of the most exploration prospect area. Work area has two sets of the reservoir, one is a putaohua reservoir, which is also a major reservoir, river deposition, is a large set of mudstone thin layer stripe sandstone; The other one is high gaotaizi for the reservoir, belongs to delta front deposition, for the thick sandstone with thin layers of mudstone layer or thick sandstone with thick mudstone layer. The main reservoir type is structural reservoirs and tectonic background of lithologic reservoirs.

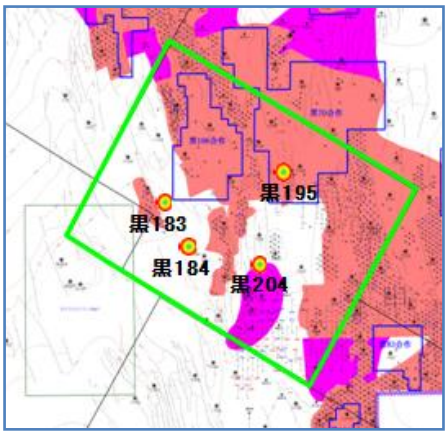


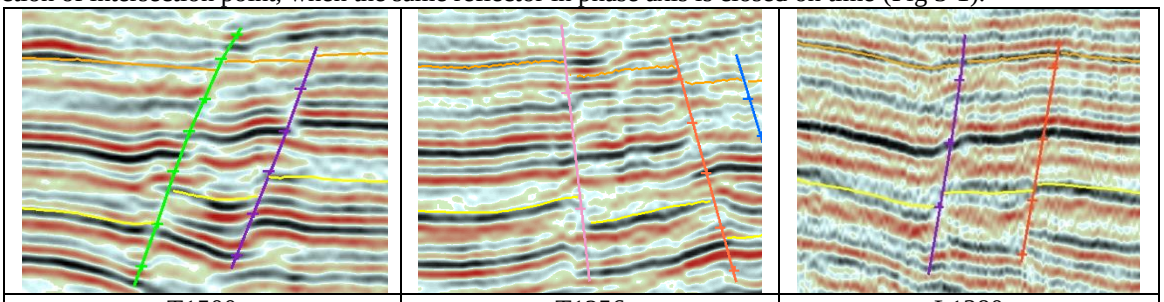
Fig 2 Geographical location in the study area

III. INTEGRATED FAULT IDENTIFICATION TECHNOLOGY

3.1 Reflect on the fault in a horizontal slice

The interpretation of the horizontal slice technology, reflects the advantage of 3 d seismic data interpretation technology. Using horizontal slice for structure interpretation, is an important content of 3d seismic data interpretation. On the horizontal section we can learn some basic geological information: reflector to; The thickness of the reflection interface; The Angle of reflection interface; The intersection of a fault and other geological boundary[1].

Horizontal slice of interpretation and the interpretation of the vertical section are similar, also to wave comparison on horizontal slice and fault interpretation. Also need to track and comparison in phase axis. In order to determine which event horizon, we can have the aid of vertical section, such as vertical section and section of intersection point, when the same reflector in phase axis is closed on time (Fig 3-1).



T1500	T1256	L1380

Fig 3-1 Part of the seismic section

3.2 spectrum decomposition technique

Spectrum decomposition technique is also called frequency division, is one of the commonly used seismic data interpretation methods, the concept is used for fault identification A conventional time domain seismic data on the time-frequency analysis of transformation to the frequency domain, according to the demand of amplitude spectrum and phase spectrum can be obtained tuning data volume. Basic principle is that Ag(t) is a seismic signal in time domain, g(f) is the corresponding frequency and signalare:

$$G(f) = \int_{<\infty}^{\infty} g(t)\mathrm{e}^{2\pi f t}\mathrm{d}t$$

Time domain seismic data into frequency domain belongs to discrete Fourier transform, the transformation from high frequency to low frequency was calculated, the amplitude of each frequency value of its mathematical expression is:

$$A(k) = \sum_{i=0}^{N<1} a(j)\left(\cos\frac{2\pi jk}{N} + i\sin\frac{2\pi jk}{N}\right)$$

Type: a(j) - in the amplitude of seismic trace sample j time; A(k) -- the transformation frequency amplitude values for k place; N - sampling points within the time window

Different frequency band of seismic data of fracture system have different sensitivity to frequency division processing of seismic data, found that some single frequency to fracture in the study area, strong indicative of can effectively identify the fault. 35 hz and 20 hz, respectively, 50 hz frequency section, through the analysis of seismic data show that the main frequency of seismic data in the study area of 35 hz, when the frequency is consistent with the seismic frequency, the frequency division processing effect is better, more real reflect the fracture characteristics, can guide the interpretation of the fault and plane combination[2].

3.3 joint interpretation of well technology

Conventional seismic fault pattern recognition is one of the main fault interpretation method, based on the fault wave group characteristics of characterization in profile. Seismic data reflects the formation of transverse and longitudinal information, but its resolution is lower, the flora belongs to the development zone, well spacing density is big, inoue explained the breakpoint is influenced by geological factors and well spacing density, inoue breakpoint combination multiple solution existence, and isolate the breakpoint. So by way of the well seismic joint section fault with breakpoints, inoue interaction explanation, to place a breakpoint, calibration profile, ensure the accuracy of fault interpretation and rationality[3]. Through the study area is a key oil group of fault interpretation result before and after contrast, clear, inoue explained breakpoint and section, to carry out the two small fault in the area, place the four breakpoint inoue. Well breakpoints, auxiliary fault interpretation by seismic section explain the form and level control fault section control plane combination, increases the fault description the credibility of this method in the district to improve the recognition ability of the fault[4].

3.4 coherence analysis technique

(1) The coherence principle: source produced pulse wave, if in the geological structure of the evenly spread, reflected wave on the seismic section will show the waveform is similar (Fig 3-4).

Local shock wave propagation in a fault or a fracture, adjacent to the acceptance of the seismic reflection wave shows as the gap is very obvious, is characterized by poor coherence and even irrelevant, some geological structure is complicated, the coherence between completely incoherent and coherent, characterized by partially coherent. Coherent data volume technology used to describe the similarity of the adjacent seismic channel signal formation, river, the lithologic body transverse inhomogeneity[5].

(2) The application of coherence

Before a work area data interpretation, can first on seismic coherent data volume along the direction of the main line, cross line direction and the time to browse, to carry out the fault investigation, understand the spatial distribution of fault. This work without formation reflector explanation can be achieved.

Coherence technology in seismic data volume is calculated correlation between adjacent seismic trace, mainly is the similarity of seismic waveform, to find not associated anomalies, the correlation analysis and calculation, the geological structure characteristics identification and description.

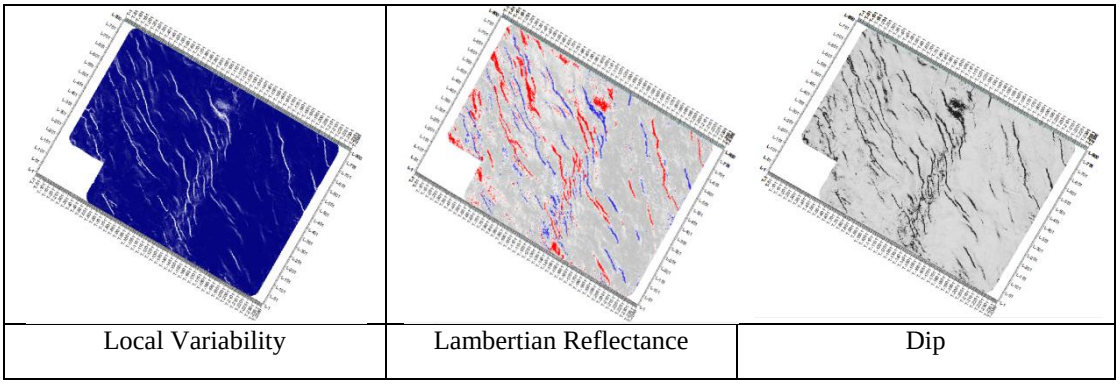


Fig 3-4 coherence figure

3.5 earthquake curvature attribute technology

Curvature properties is a geometric attributes of seismic attributes, its mathematical theory is aimed at a certain point on the curve tangent Angle for arc length of rotation rate, defined by differential, shows that the degree of curve deviates from the straight line. In the earth's physical curvature attribute is used to calculate the distribution of geological bodies in the geometry space form, to realize the recognition of geological features, such as fault, fault, curvature attribute can be divided into 2 d and 3 d, 2 d curvature attribute is calculated based on T figure, such as, did not join the guidance of the seismic data, the result can't reflect the reality of the underground structure form; Curvature calculation is based on 3 d seismic data, to convert seismic data body, form the Angle of the data, method of an arbitrary point by calculating the curvature, and the combination of the final produce three-dimensional curvature. Based on three-dimensional curvature attribute, this paper calculated the seismic data respectively the most-positive curvature and the minimum negative attributes, by comparing the most-positive curvature of the sensitivity of the stronger of the district, to study the fault has good recognition effect[6].

IV. CONCLUSION

Through a variety of fault recognition technology integrated application, describe faults more effectively in the seismic interpretation, but also increase the understanding of the fracture system in the study area, improve the local structure form, the comprehensive technique in the study area have achieved good application effect. Conclusion:

1) The integrated use of spectrum decomposition technique, coherence analysis and seismic attribute technology for rate, from the seismic data volume reflects the fault characteristics of objective, improved the seismic resolution is not enough, on the recognition of small fault has good effect, as well as the fault plane combination play an important guiding role.

2) Introduction of new technology through analyzing three color mixing, unlike traditional rely on RGB color analysis technology, three color mixing technology based on the fusion of HSV and CMY color pattern analysis, overcomes some defects in a single attribute recognition, the advantage for each attribute according to the weight distribution of color, this advantage combination significantly improve the recognition ability of the fault[7].

3) On the basis of the detailed fault interpretation and application of 3d geological structure modeling technology combining with the logging interpretation result, the overall comprehensive guidance for fault, starting from the point, surface, body three aspects, carries on the breakpoint position, reasonable combination plane fault, fault space intersection relationship building. The method in the study area have achieved good application effect, improve the rationality and credibility, the fault is of great significance to the development work in the study area.

REFERENCES

[1] Li Zhandong, XuDayou. Fault identification technology in beir oilfield application [J]. The practice and understanding of mathematics, 2015, 05: 94-101.
[2] Fang Hongping, GuHanming. Progress in fault recognition and quantitative interpretation method [J]. Journal of engineering geophysics, 2013, 12:609-615.
[3] Zhang Qingyun. The comprehensive interpretation of seismic data of fault recognition and interpretation of applications [J]. Journal of China petroleum and chemical industry standard and quality, 2012, S1:272.
[4] Li Zhandong, Zhang Mingxue, Hu Yushuang. Sag in hailaer basin tectonic evolution and oil and gas control [J]. Science, technology and engineering, 2010,09: 2066-2074+ 2078.
[5] Liu Shufen, Zhang Haixiang. Detailed interpretation technology application in Suzy Noel oilfield development [J]. Progress in geophysics, 2014, 03:1189-1193.
[6] Chen Liguo. SaNa technology development zone well seismic joint fine structure interpretation and application [D]. Jilin university, 2013.
[7] Feng Kui. 3D seismic data interpretation technology research and application in YaKeLa [D]. Xinjiang university, 2009.