DOI: 10.21276/sb.2016.2.6.3

Scholars Bulletin
(A Multidisciplinary Journal)
An Official Publication of "Scholars Middle East Publishers",
Dubai, United Arab Emirates
Website: http://scholarsbulletin.com/

ISSN 2412-9771 (Print)
ISSN 2412-897X (Online)

Application of Structure Fine Interpretation Technology

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Abstract: Structural conditions as one of the elements of oil and gas accumulation, attracted widespread attention in the oil and gas field exploration and development. Typically, the lower the accuracy of regional exploration, structural studies were focused on the basin frame; high rolling exploration and research on the structure of the accuracy requirements of the block structure of the internal small fine interpretation and depiction is the key to the success of drilling. In the structural conditions extremely complex Dongpu depression, mainly in the oil and gas reserves among the block group, the regional tectonic conditions are relatively clear, to block the internal structure of the small fine description of rolling exploration focus. How to carry out the internal structure of complex fault block? Making research and services in the oil exploration and development, not only an important task Dongpu depression, but also in eastern China hotspot rift basin. I try to take advantage of three-dimensional seismic interpretation; seismic data between wells describe small structures, numerical simulation techniques Wen 209 fault throw of less than 5 m were forecast to achieve fine structure described in the block area.

Keywords: small fault; well-seismic combination; structure fine interpretation; numerical simulation technology; prediction; Wen 209 Block.

THE STUDY OF SMALL STRUCTURE

The exploration of Dongpu Depression is pretty good and structural feature is clear .It need to use the structure fine interpretation when in the rolling exploration and development. Especially for the area where is less than 0.1 km^2 of small structure internal fault and affected by fault tectonics is described, can effectively reduce the exploration risk [1].

3-D seismic data interpretation

More than 80% of oil and gas concentration of Dongpu Depression in fault block traps， the fine interpretation technology of small structure is of great significance for residual oil exploration.

After comprehensively using the technology of horizontal slice, coherence cubes and three-dimensional stereoscopic tracking to deal with 3-D seismic data, it can maximize the realization and description of small fault identification and realize accurate positioning for the occurrence of small fault. On this basis, we have given the contrast analysis of drilling data and cross-well fault. By comparing the synthetic record with seismic data, it can confirm the fault occurrence and spatial distribution characteristics, so as to achieve the purpose of structure fine interpretation. For some small fold, fault related fold, fault terrace can be describing by the method of larger scale a den crypt isoline. At the same time, combined with 3-D seismic continuous layer along the horizontal time slice technique, seismic attribute optimization and coherent data volume interpretation technology, etc. It can determine the positive and negative structural types and elements by using the data of dynamic test [2].

Cross-hole seismic data interpretation

The application of cross-hole seismic data can explain the structure better. The seismic data with high energy and frequency can be well applied in the interwell structure because of using underground excitation and receiving method for cross-hole seismic. Then compare the cross-hole seismic data with the 3-D seismic data to make a detailed analysis of the correlation between wave group characteristics which could greatly improve the accuracy of the 3-D seismic interpretation in work area.

THE PREDICTION OF SMALL FAULT

The theory

The big fault, small faults, cracks, micro cracks and fracture structure which formed under the same period stress is fractural structure. The fractural structure under statistical scale transform is self-similarity. For the fault of length L, vertical fault slip of T, when the scale changes can be expressed as:

$$N_1 \propto L^{-D_1} \quad (1)$$

$$N_t \propto T^{-D_1} \quad (2)$$

Meanwhile, the L and T can be express as:

$$T_1 \propto L^n \quad (3)$$

And N_1 is the number of fault which the length is larger than scale plate, N_t is the number of fault which the separation larger then scale plate, D_1 is the fractal dimension of fault which the length larger than the floor level. The n is a constant related to the fault characteristics. N value range of 0.5 ~ 1.5, when the n value is 1, the fault plane pattern is self-similarity [3]. When it is not, the fault plane pattern is self-affinity which is regularly changed with scale change.

On the basis of the seismic identification of small fault, using the type (1) to make a deviation calculation can be roughly concluded the unknown small fault density which is less than seismic interpretation precision. To take the derivative of (1), get the small fault length distribution which the length is L_m:

$$f(L) = L^{D_1}{}_m L^{-(D+1)} \quad (4)$$

Application

After gridding the wen 209 fault block, make a prediction according to the following step--

1. The fault, fault displacement, inclination, inclination and fault endpoint coordinate input system, given the L_m to simulate the fault.
2. According to the known fault data, we make fitting of fault occurrence, density, length and distribution function.
3. In the double logarithmic coordinate, separately fitting the relationship with the fault amplitude T, the fault length L and the accumulated fault. Then calculate D_1, D_t and n according to the relationship between the T and L (Figure 1).
4. We can calculate the number of small faults which the lower limit length is L_m by type (1).And according to the known fault random occurrence distribution function to calculate the length of small fault and The corresponding vertical slip , towards , Orientation and tilt angle by type (4).
5. According to the number of known fault density distribution function, we select the random small fault density distribution data and calculate the distribution of small fault density.

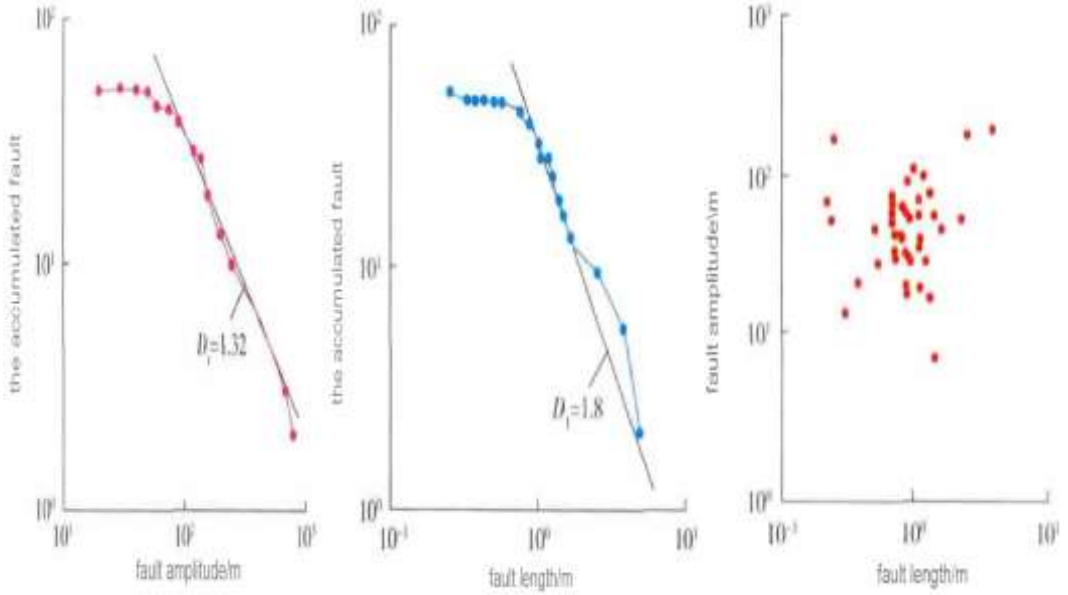

Fig-1: The data statistics of Wen 209 fault block fault

Interpretation of result

Statistics Wen 209 fault found greater than the length of the lower limit of the fault number and fault length, vertical throw in double logarithmic coordinates a trend line is a straight line, indicating that two fault parameters in line with the self-similarity, therefore, use this method to predict small fault credible. After the article 209 of the coring small faults were observed statistics showed that the number of millimeter to centimeter-level fault density tiny fault, and the fault from known total power law extrapolated fault density similar. In the curve on both sides, broken apart, the length of a large seismic tomographic data can be explained with the smallest fault can be verified by core observation, both in line with the mathematical relationship, it can be concluded, throw, length located small faults between the two can be calculated according to this method.

According to the above method calculated the distribution of small faults after multiple simulations, the number of statistical units appear small faults. It can be calculated in different regions of small faults probability of occurrence. Fault probability of occurrence of a large part of it is small faults, fracture strengths site (see Figure 2), can make use of numerical

calculation, comparison between the wells to determine the occurrence and location of faults [4].

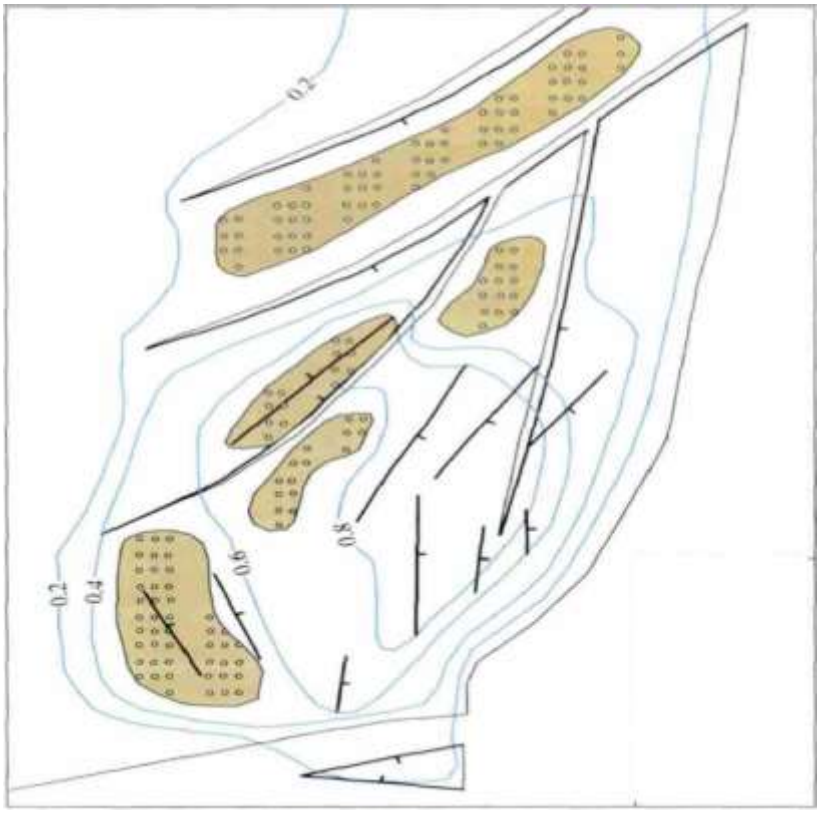

Fig-2: The distribution probability planar graph of minor fault

The results show that the probability of small packet 209 basic faults appear in 20% to 80%, the probability of local small faults occur more than 80% of these areas close to the central block, in many large fault ends. At the end, the use of seismic data to identify small faults are well developed, the site correspond to the relative concentration of stress, a greater degree of fragmentation formation, which is the most should consider rolling development plan to deploy parts of small faults, fractured reservoir is relatively favorable drilling the target area [5-7].

CONCLUSION

3D seismic interpretation of well data with seismic fault law interpretation by means of numerical simulation, fault seismic resolution can be carried out under reasonable prediction and description. Comprehensive variety of information to achieve fine structure interpretation can reduce exploration risk, rolling exploration to increase reserves and expand the edge, looking for remaining oil-rich region to provide a reference, as well as tapping the potential of the old program deployment and provide the basis for adjustment [8].

REFERENCES

1. Badham, J. P. N. (1982). Strike slip orogens: an explanation for the Hercynides. *Journal of the Geological Society of London, 139*, 493-504.
2. Gibbs, A. D. (1990). Linked fault families in basin formation. *Jour Struct Geol., 12*(4), 105-115.
3. Dahlstrom, C. D. A. (1969). Balanced cross sections .Cana- dian. *Journal of Earth Sciences, 6*(7), 743~757.
4. Corredorfo. (1996). Three-dimensional geometry and kinematics of the western thrust front of the eastern Cordillera. *Columbia AAPGSEPM, 5*, 29-30.
5. Van Wagoner, J. C., Mitchum, R. M., Campion, K. M., & Rahmanian, V. D. (1990). Siliciclastic sequence stratigraphy in well logs, cores, and outcrops: concepts for high-resolution correlation of time and facies.
6. Marfurt. (2006). Robust estimates of 3D reflector dip and azimuth. *Geophysics, 71*(4), 29-40.
7. Hart. (2006). Seismic Definition of Fracture-Swarm Sweet Spots. *SEG Annual Meeting*, 570-570.
8. Ashcraft, T. L., & Saunders, R. K. (1976). Sulofnation of Peortleum Feedstocks in a Wiped Film Reactor, *SPE* 6119.