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The Basic Application of Seismic Data Interpretation

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Abstract :

The seismic data with continuous drilling data There is nothing comparable to this in the transverse direction, and contains a reservoir of information is very rich, so seismic reservoir prediction technology is an important research direction of oil and gas exploration and development. At present, the application of seismic information of lithology, reservoir prediction is still in the stage of exploration and accumulation of technology. Most of the theoretical model of the technology is still in the exploratory stage, in practice the lack of universality and pertinence. The sedimentary facies reveals the sedimentary environment of objective section, origin and distribution rule of the reservoir. By sedimentary facies study, reservoir engineers can help establishing reservoir geological conceptual model for seismic data processing and interpretation of digital the foundation. Using seismic reservoir prediction is necessary for oil exploration and technology must, high investment, high risk, offshore oil and gas exploration drilling less is more important Significance. Geological and seismic reservoir prediction is the core technique of combining seismic and geological exploration process. With the change of reservoir exploration from structural reservoirs to concealed oil and gas to adapt, combined with seismic geology must also from the macro level to the fine, description, analogy, genesis, dynamic reservoir prediction from the level extension. The application of sequence stratigraphy to seismic sedimentology embodies two aspects. The combination of seismic and geological seismic structural interpretation in order to understand the underground complex topography and the existence of faults combination may be provided, through the fine horizon calibration and well seismic combination system and a series of analysis processing technology can identify small faults, is the main the content of the late development of oil and gas field.

Keywords - *seismic facies, seismic reservoir parameter inversion method, structural interpretation*

I. SEISMIC FACIES RECOGNITION

Seismic facies is distributed in certain range of 3D seismic, it is the reflection of sedimentary facies in the seismic profile, the reflection unit is mainly reflected in seismic reflection structure, geometric shape, amplitude, frequency, continuous and interval velocity. The seismic reflection unit represents formation in sediments of lithology combination, bedding and their sedimentary characteristics. Seismic facies and sequence related, first division of stratigraphic sequence, broadly identified as favourable strata for the different types of reservoirs in vertical development, through favorable sequence of seismic facies analysis, reservoir sedimentary facies and transverse distribution range can be determined, thus reservoir integrated prediction provide certain basis.

A. External Geometry

External morphology is an important seismic facies marks. It tends to reflect the different sedimentary environment. If the reflection unit reflection structure similar to that of, as long as sedimentary bodies or different sedimentary system it in shape is different. The common form of external a sheet, sheet drape, cuneate, beach, lens shaped dome shaped and filling type (Fig. 1).

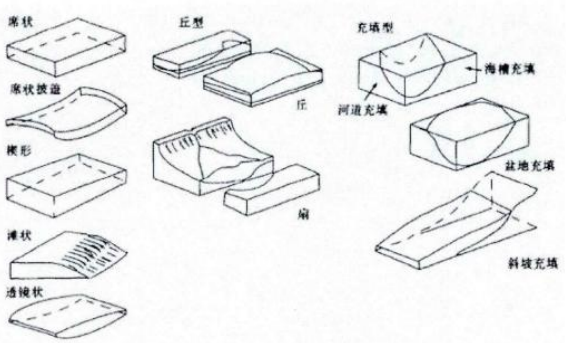

Fig. 1 External geometric shape of seismic reflection

B. Internal Reflection Structure

(1) Parallel and sub parallel reflection structure: the reflection structure reflection cophasal axes are parallel or slightly undulating, shown in Figure 2 A, B sheet, sheet draped cover and filling the reflection unit is generally the structure. (2) spread reflection structure: two adjacent reflection in-phase with axial with a direction inclined and divergence in the in-phase reflection axis increased and thickened, in the direction of convergence reflex came to an abrupt end, as shown in Figure 3 C. This phenomenon may is by the formation thickness to dip direction thinning, and seismic resolution is not up to the requirements by

the. Wedge shaped element is often seen as divergent structure. This is mainly settling velocity difference, is a favorable area of oil and gas accumulation.

Skew sediments formed in or before the migration process is driven by progradational reflection configuration in-phase axis in the dip section relative to the reflection layers are skew. The sediment in the water to the basin to promote the process, the deposition in the formation of reflection configuration, he reflects the shelf platform or delta system to the direction of the foreland basin in the delta slope environment. According to the reflection structure differences, can be divided into s, oblique type, tangent type, composite skew and imbricate type six species, as shown in Figure 3. Note the foreset structure in different directions of the measuring line form, in the tendency to appear before the product shape, in the direction of a dome shaped.

(4) Hummocky reflection structure: irregular, discontinuous sub parallel reflection cophasal axes consisting of, with non systematic reflection cophasal axes termination and splitting phenomenon. Reflection of the overlying strata gradually graded for parallel reflection and lateral ground reflectance variation is relatively large. The reflective structure may be caused by weak stream or river.

(5) Clutter shaped reflection structure: the reflection structure as its name, very mixed and disorderly, no rules to follow, the amplitude and phase axis continuity is poor, but the amplitude is larger. The reflection structure formation and formation suffered a violent motion, the motion leads to the formation of deformation, and the deformation is more powerful, such as the mountain body landslide, volcanic activity, the plate movement. Small scale motion such as fold formation will cause the seismic facies. Also, like intrusive body piercing body will also form a chaotic reflection structure is mainly due to the geological body reflection energy in the noise level, not very good recognition.

(6) The reflection structure that strata in vertical no wave impedance difference, namely formation in the lithology and physical the changes is very small, resulting in longitudinal waves without reflection. No reflection structure generally formation quickly and uniformly deposition process. In the seismic profile can often see a stable mudstone is the reflection characteristics of such, in such a reflection structure compounds of carbon and oxygen to preserve the, but sometimes also reflect homogeneous, no bedding, highly distorted or angle very continental sandstone, mudstone, salt rocks, reefs and fire into rock body.

II. SEISMIC RESERVOIR PARAMETER INVERSION METHOD

A. Seismic Impedance Parameter Inversion

Seismic wave impedance inversion, namely logging constrained inversion method based on seismic data and seismic impedance inversion (SSI) is one of the seismic wave impedance inversion method is currently the most common application, its strong modeling capabilities, able to adapt to the complex geological conditions and development has become one of the most widely used method for wave impedance inversion at present. This method is suitable for the number of wells less area, the main advantage is to obtain the reflection coefficient of wide band seismic records can better solve the multi solution problem, wave impedance model so that the inversion tends to be more real. But in practice, due to the existence of quality problems such as earthquake, logging and parameter setting problems the researchers made different inversion results will be different, the inversion effect is also different, the influence of reservoir prediction.

B. Inversion of Reservoir Physical Parameters

Inversion of reservoir parameters in seismic wave impedance inversion of well logging properties or parameters inversion results on the basis of a reservoir prediction. It uses the existing wells information, the physical parameters of the area without well quantified. When the area in drilling wells data, can be used directly for reservoir parameter inversion soon, physical parameter information extracted from the grid in the work area, you can get the inversion results of physic parameters of a reservoir. However, because of this result by the number and distribution of the drilling work area is restricted and fewer constraints, so usually only get one a relatively rough reservoir parameter inversion results. This method is not feasible in the prediction of the seismic reservoir in the sea, due to restrictions on offshore drilling platform, the drilling quantity is limited, so it is impossible to get more and more points Uniform drilling data, reservoir condition parameters obtained by this method can not accurately response areas without wells. And the method which we normally use is the use of the fitting relation between logging curve and impedance curve, mathematical model, mathematical model, the non well area of sand body the sandstone, inversion of physical parameters of sandstone thickness and porosity, thus saving the high cost and investment due to drilling, and provide reliable reference for petroleum exploration and development. Of course, the basis of reservoir parameters inversion is still the seismic data, seismic data quality, data fidelity amplitude, directly affects the accuracy and resolution of the inversion results, thus to get the inversion results of reservoir parameters accurately, not only to get as much as possible in the real seismic waves under multiple constraints The

inversion results of impedance inversion parameters or logging parameters should be guaranteed in the acquisition and processing, as far as possible to ensure the authenticity of seismic data, reliability.

III. STRUCTURAL INTERPRETATION

A. Fine Horizon Calibration and Well Seismic Combination

Amplification of objective interval show that using different frequency synthetic seismogram making through of Biju frequency rate wavelet into the synthetic records, and then fine tune until the synthetic seismic records and seismic profiles matching the best.

The accurate time depth information in the VSP data, can accurately identify each reflection layer formation, establish more relationship between geological layer and seismic horizon directly, and the layer of identification and calibration is more reliable, especially in the process of interpreting the thin obvious effect. By using VSP data, combined with the ground the profile on both sides of the top and bottom surface of thin reservoir for accurate calibration, showing a large number of thin reservoir distribution in vertical close. Fine horizon calibration at the same time, to the studies of the wells for each row, by contrast I explained, a detailed study has found the contradiction between the geological stratification and earthquake, and then according to the principle of cycle division and comparison of the geological interface, also known as seismic well joint geological hierarchy.

B. Analysis And Processing

In order to facilitate the change of fault shape from the trends in the research horizon, down from the manual interpretation of multiple levels (Fig. 2).

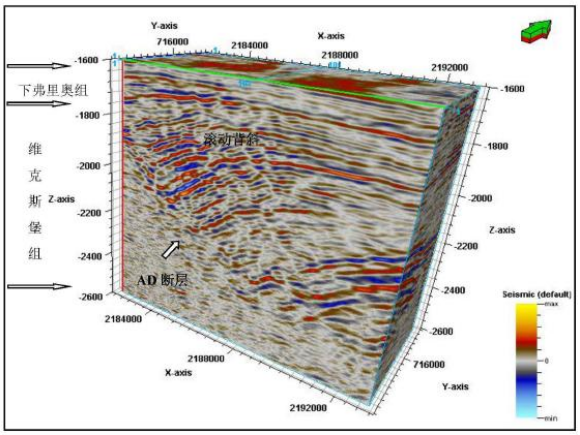

Fig. 2 3D seismic data body

First use to explain the level in smoothing low-pass filter, noise can reduce the impact of artificial interpretation. Get the level of time contour map shows the basic morphological level. Using curvature properties, especially the maximum curvature of structural interpretation, found the special structure (Fig. 3).

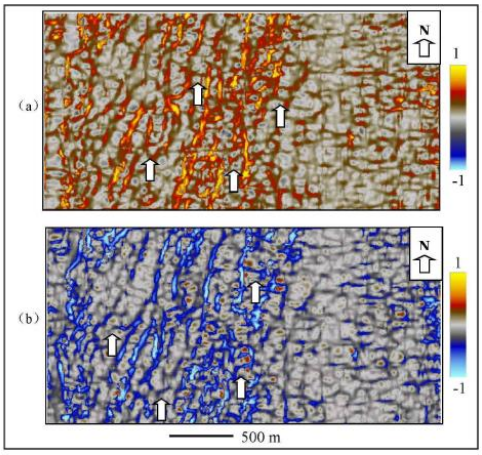

Fig. 3 Different curvature properties

The nature of positive and negative maximum curvature attribute values can reveal faults, Ross combination (left red right blue) with instructions to the normal fault, the right combination (left - / blue red) indicates that the reverse normal faults (Fig. 4).

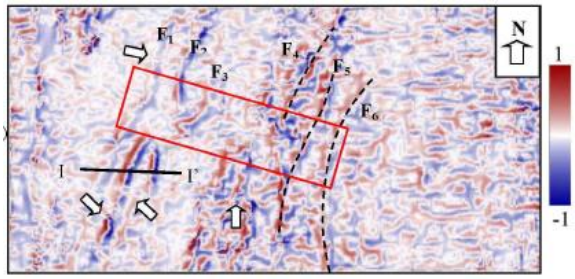

Fig. 4 Maximum maximum curvature

IV. CONCLUSION

Study on sedimentary structure and tectonic sedimentary core description, but due to limited drilling, coring less, the coring data in the horizontal, vertical and plane has limitations. Seismic facies reflect underground geological body in the seismic section, is the sum of the sedimentary facies in the seismic reflection profile on the main feature of the section structure. The reservoir lateral prediction to solve reservoir lithology, pore and permeability by using seismic data, such as full physical parameters and Kong Xiliu properties for the content of the reservoir prediction is one of the most popular topics in oil geophysical exploration in the work start time is not long, but rapid progress, achievements, prospects, is a worthy of deep research. The structural interpretation of first clamping position, then follow the easy It is difficult to explain the principle of thinning, which has important implications for the exploration and development of oil and gas fields, in the process of interpretation, which has been interpreted in the interpretation of the profile.

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