

ABSTRACTS

Double focusing method for 3-D geometry-optimized design. Di Bangrang, Wang Changchun, Gu Peicheng and Ni Chengzhou. *OGP*, 2003, 38 (5): 463~469

The double focusing method is a new method for special-target-oriented 3-D geometry-optimized design, which can quantitatively predict the spatial resolution, the precision of amplitude and the AVP character of seismic imaging. The ordinary analysis of CMP bin attribution is macro and overall, which emphasizes on obtaining the optimal horizontal stacking effects; but the analysis of double focusing character is special target-oriented and regional, which emphasizes on obtaining the optimal precision of migrated imaging. Therefore, combination of the two methods can complement each other and improve the effects of geometry-optimized design. Because of different media model having big difference in double focusing computation, the study of the task needs to be carried out in three steps: algorithm in homogeneous media, algorithm in layered media and algorithm in complex media. The paper finished the first step, that is the study of double focusing algorithm in homogeneous media and the development of corresponding software, which is as a supplement of 3-D geometry-optimized design as a supplementary method.

Key words: double focusing imaging, geometry, point scattering, resolution function, focusing aperture angle

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High-resolution seismic data acquisition techniques in Baobei area, Yanqi basin. Wang Dezhi, Chang Yuju, Zhang Fusheng, Zeng Luan and Chen Yaqiang. *OGP*, 2003, 38 (5): 470~474

Through experiment and scientific proof of high-resolution seismic data acquisition techniques in Baobei area, Yanqi basin, the paper summed up a set of seismic data acquisition measures suitable for the area: ① adopting uphole survey in double well to clarify the ghost reflector, then determining the suitable shooting well depth; ② adopting short group interval and short geophone interval

for receiving and small charge size for shooting can effectively improve the resolution of seismic data; ③ adopting accelerometer having relatively high natural frequency and high sensibility; ④ adequately deepening planted depth of geophone (planted depth of 50~60 cm), improving noise environment of spread and doing our best to reduce the noise in relation to environment; ⑤ correctly choosing geometry and apparatus factors. Adopting above-mentioned methods, the apparent dominant frequency in major exploration targets can be 60~80 Hz; the resolution increased 2~3 times as against former ordinary seismic section; the geologic features such as fault, pinch-out of formation and unconformity are more clear.

Key words: seismic data acquisition, high-resolution, shooting, receiving, ghost, attenuation by absorption, Yanqi basin

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Algorithmic analysis of 3-D first break refraction static corrections. Fan Hua, Xu Guangmin, He Yong and Gao Suluo. *OGP*, 2003, 38 (5): 475~481

The 3-D first break refraction static corrections adopted time-term technique has difficulty in solving large-scale set of equations because of ill-conditioned property of set of equations. Using the fold technique, the paper made fold processing of seismic-acquired first break data, which can basically eliminate the influence of travel time on the top interface of high velocity layer, further using SIRT method for solving can not only eliminate the ill-conditioned problem of set of equations, but also dramatically reduce the numbers of equation while guarantee of precision, which greatly improved the solving speed. The correlation of processing results in theoretical data and real data respectively by different statics showed the correctness and effectiveness of the method.

Key words: 3-D, first break refraction, static corrections, algorithm, time-term, solving set of equations, ill-conditioned matrix

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Numerical modeling of P-wave and S-wave separation in elastic wavefield. Ma Detang and Zhu Guangming. *OGP*, 2003, 38(5): 482~486

Common – used the full elastic wave equation to carry out the numerical modeling of elastic wavefield only obtained a hybrid wavefield of P-wave and S-wave. When you want to obtain P-wave and S-wave wavefield, generally the wavefield separation is carried out after hybrid wavefield being obtained or using acoustic equation to model the P-wave and S-wave wavefield, but these methods are very difficult to ensure the amplitude of P-wave and S-wave do not disorder. The paper gave an equivalent equation of full elastic wave equation, which contains variations of both the hybrid wavefield and the pure P-wave and S-wave wavefield. Using pseudo-spectrum method to solve the wave equation, obtained totally separated wavefield of pure P-wave and S-wave while obtaining hybrid wavefield, and preserved the information of mutual transformation of P-wave and S-wave energy. The analysis of modeling wavefield showed using numerical modeling of elastic wave separation has important meaning in respect of knowing the propagating rule of elastic wave.

Key words: elastic wave equation, wave decomposition, pseudo-spectrum method

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Method of static corrections under complex near-surface conditions. Wang Zhenhua, Yuan Ming-sheng, Yan Yukui, Chen Zhiyong and You Fubao. *OGP*, 2003, 38(5): 487~500

For the complex near-surface conditions, the issue of static corrections often connects with such issues as lower S/N and complex underground structures etc. Therefore, it needs to carefully analyze and study in many processing steps, well-doing each processing, which includes in repeat tests of key parameters in selecting floating datum and field elevation corrections, detection of refraction, time-window of static corrections, non-surface-consistent static corrections, velocity analysis and NMO and mute etc., in order to select the most reasonable parameters and with cooperation of advanced software of static corrections we can get ideal results of static corrections.

Key words: complex near-surface, floating datum,

reflection static corrections, refraction, static corrections

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Study of poststack relative preserved amplitude processing. Ling Yun Research Grop. *OGP*, 2003, 38(5): 501~506

The raising resolution processing is an important step in seismic data processing, along with gradually deepening of lithologic seismic exploration, the people begun to know that the relative preserved amplitude is an important basis of high-resolution processing, among which the prestack raising resolution is mainly to achieve the goal of relative preserved amplitude by surface-consistent statistical method. However, poststack raising resolution is also one of steps of raising resolution processing, but importance of poststack relative preserved amplitude does not rivet full attention of people. The issue of poststack preserved amplitude does not non-existence in practice, it is often neglected by the people instead. The paper specially studied the issue of relative preserved amplitude for poststack raising resolution, presented basic conditions of poststack relative preserved amplitude for raising resolution and judged whether a poststack raising resolution processing meets the basis of relative preserved amplitude or not.

Key words: improving resolution, poststack relative preserved amplitude processing, poststack spectrum whitening, poststack inverse Q filtering, minimum entropy deconvolution, seismic attributes slice, seismic data interpretation

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Prestack depth migration by surface-controlled illumination of multi-geologic targets. Chen Xiumei, Wang Huazhong and Ma Zaitian. *OGP*, 2003, 38(5): 507~511, 542

Prestack depth migration by controlled illumination is a fast and geologic-target-oriented migration technique. It can improve the image quality of the targets by controlling the directional characteristics of incident source wavefields at the targets. We proposed a method for surface controlled illumination of multi-geologic targets, which directed to complex media, appropriately selected multiple targets and controlled the source wavefields illumina-

nation of multiple targets at the same time to obtain the fine image of structures at the multi-targets. The Marmousi model was used for numerical computation of the method and the results were used to compare with that migrated from the method for surface controlled illumination of single-target and with the migrated results of conventional shot gathers and plane wave as well. The results showed that prestack depth migration by illumination of multi-geologic targets not only can greatly improved the imaging quality in multi-targets area, but also has higher computational effort for ordinary migration in shot domain.

Key words: geologic target, synthetic operator, source wavefields, surface controlled illumination
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Application of zero-offset seismic trace fitting in time-frequency domain to marine high-resolution seismic data processing. Wen Shuliang, Wang Huandi, Yuan Yijun, He Hanyi and Liu Yongjiang. *OGP*, 2003, 38(5): 512~516

The function of CMP stack in seismic data processing is to suppress random noise and eliminate multiple, but associated disadvantages are decreasing the resolution of seismic data and smearing the amplitude character. In order to improve the resolution of seismic data and the hi-fi of amplitude, many researchers have presented variety of fitting methods to replace CMP stack, but each fitting method has his own shortcomings, such as poor ability of improving S/N. Starting from application aspect, the paper discussed the characters of zero-offset fitting in time-frequency and necessity of application of prestack elimination of different linear interference and multiple to marine high-resolution seismic data processing. The real data processing showed so long as the prestack noise-elimination well-done, application of zero-offset seismic trace fitting in time-frequency domain to replace CMP stack is favorable to improve seismic resolution and hi-fi of amplitude.

Key words: seismic data processing, fitting method, time-frequency domain, CMP stack, high-resolution, hi-fi of amplitude, beam-focusing filtering, mean value weighting

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Fracture inversion using P-wave reflection data and cases. Ma Zhonggao. *OGP*, 2003, 38(5): 517~521

According to directional relation of NMO velocity in heterogeneous anisotropic media deduced by Grechka and Tsavankin, the paper predicted the fracture of media. First, the model observation in laboratory is carried out, which results showed the orientation variation of NMO velocity above the fractured media is ellipse, the direction of major axis represents the trends of fracture, the ratio of major and minor axes is proportion to the developed density of fracture. The method is used for limited azimuth 3-D seismic data in a work area of northern Tarim basin, the predicted fracture orientation is coincided with the results revealed by logging data, which achieved good applied results. This showed the feasibility of the method in identification of fractured direction and density.

Key words: fracture, NMO velocity, ellipse, azimuth, anisotropy, inversion

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Application of joint time-frequency distribution and its attribution. Yin Xingyao, Zhang Kui and Zhang Guangzhi. *OGP*, 2003, 38(5): 522~526

In view of the seismic signal being non-stationary signal, the paper discussed the methods of joint time-frequency distribution in analysis of non-stationary signal theory and its time-frequency attributes. Generalized into local frequency from integral frequency, the method of joint time-frequency distribution effectively analyzes the signal based on the variation of frequency with time. The attributes (average frequency, instantaneous bandwidth, twist and peak level) obtained from joint time-frequency distribution can break out the limitation of traditional instantaneous attributes, effectively point out the variation in geologic formation and be applied in seismic data interpretation as a good attributes.

Key words: joint time-frequency distribution, time-frequency, attributes, kernel function

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Integrative interpretation of minor fault and its application in Yingtai area. Wu Qinglong, Zhang Yanqing and Cui Quanzhang. *OGP*, 2003, 38(5): 527~530

Yingtai area of Jilin oilfield is a typical fluvial deposit, it has the characters of thin reservoir and minor structural amplitude. Therefore, the minor fault has big influence on structural attitude and oil-water relation. Through application of fault interpretation techniques such as coherent data volume with predominant frequency band, dip, azimuth and fault edge, the paper not only basically solved the contradiction between conventionally interpreted results and oil-water relation revealed by real drilling results that puzzled the oilfield development, but also discovered and defined a group of structures with low amplitude related to minor faults, provided basic data for increasing production and reserve and revising development plan.

Key words: coherence, predominant frequency band, dip, azimuth, fault edge, oil-water surface

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Study on method of lithologic trap reservoir description and its application. Liu Jinping, Liu Yunwu, Gao Jun and Xie Chunlai. *OGP*, 2003, 38(5): 531~534

Based on high-resolution seismic data, using logging, drilling and seismic data and starting from analysis of sedimentary mini-facies, the paper built up geologic and seismic response model mainly for channel sand body and sand body in river mouth bar; according to the characteristics of seismic reflected wave group, impedance values from seismic inversion and other seismic attributes and parameters, the regularity of sand body changes and distribution in studied area have been defined. We summarized identification techniques for lithologic traps characterized thin and interbedded layer and achieved better results in practical application in Gulong and Talaha areas, west of Daqing Great Anticline.

Key words: high-resolution, sedimentary mini-facies, lithologic trap, reservoir description

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Application of seismic constrained model-building

technique to reservoir modeling. Yang Yaozhong Qu Shouli, Sui Shuling and Liu Zhihong. *OGP*, 2003, 38(5): 535~539

Enhancing oil recovery by study of remaining oil distribution is the subject of oil-field development in east region, the fine reservoir modeling study on the basis of fine geologic model-building is key tool of effectively determining the abundance zone of remaining oil in the reservoir. The main oil-fields of Shengli oil-region have come into high watercut period successively, the reservoir has been waterflooded in large scale and the waterflooded area and volume have been further enlarged, so looking for remaining oil and enhancing recovery become the key and difficult points in development of oilfield and are also the key of stable production at the same time. On the basis of summing up former 5 rounds of fine reservoir simulation in Shengli oilfield, the paper try to systematically analyze and study the fine reservoir simulation. Starting from geologic model-building technique assuring the simulation precision, the paper analyzed relevant techniques that have a impact on precision of structural model and reservoir model, hopping to guide geologic model-building of reservoir and study of reservoir simulation for other oilfield in the later stage of development.

Key words: oil-gas recovery factor, reservoir simulation, structure, reservoir

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Influence of microannulus' thickness on capacity of acoustic wave-logging tool. Diao shun, Qiao Wenxiao and Du Guangsheng. *OGP*, 2003, 38(5): 540~542

Evaluation of the thickness of microannulus in cased borehole is very important in petroleum engineering. The dependence of amplitude of first break for acoustic logging in cased borehole on the thickness of microannulus is studied in this paper with Finite Element Method (FEM). The numerical results show when the thickness of microannulus is less than 1 mm, the variation in the thickness of microannulus has a minor effect on the amplitude of acoustic first break; but when the thickness of microannulus is larger than 1 mm, the coupling of casing with cement becomes weaker, the acoustic energy is difficult to enter the beds, leading the am-

plitude of casing wave to increase. The paper considered that the 1 mm thickness of microannulus can be taken as a critical value having influence of microannulus on well-logging aimed at well-cementing quality.

Key words: microannulus, cased well, acoustic logging, detection ability

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Experimental research on electrical properties of shaly sand under different salinity. Deng shaogui, Xie Guanbao, Fan Yiren and Li Feng. *OGP*, 2003, 38(5):543~546

On the basis of electrical experiment of rocks in different salinity, performing the study for relative volume of bound water in shaly sand under different salinity and its electrical properties is to reveal the change of electrical properties in shaly sand caused by variation of bound water saturation and formation water salinity. The study showed that the shaly sand in different salinity of saturated fluid has different bound water saturation, and decreasing the bound water saturation with increasing the salinity of saturated fluid. The resistivity of rock under the condition of bound water is under the influence of resistivity of formation water, bound water saturation and shaly additional conductivity. In a condition of lower formation water salinity, the resistivity of rock may appear low resistivity property because of higher bound water content and shaly additional conductivity.

Key words: shaly sand, bound water saturation, formation water salinity, cation exchange capacity, conductivity

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Seismic identification of meandering channel sedimentary subfacies. Yu Jianguo, Lin Chunming, Wang Jinduo, Guo Ya and Zhang Mingzhen. *OGP*, 2003, 38(5):547~551

The method that studies sedimentary facies of meandering channel by using the analysis of 3-D seismic coherent data has been put forward in the paper. Its advantage is to have more clear identified characteristics to sedimentary system based on geological analysis and especially is practical in the

area with a little drilled data. The remarkable effects have been acquired by using the method for Tertiary in northeast area of Jiyang depression.

Key words: 3-D seismic, coherence data analysis, reservoir prediction, sedimentary facies, meandering channel

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Es³ salt-structural types of Dongpu depression and seismic identification. He Yawei, Yao Hefa, Duan Hongmei, Chang Junhe and Liu Yazhou. *OGP*, 2003, 38(5):552~556

Three sets of salt-bearing cyclothem in deep lacustrine facies are developed in Es³ formation in the north of Dongpu depression, which led salt rock to flow and deform because of buried depth and action of structural force in the latter and then formed many salt-related structures or lithologic traps. Since salt rock is always accompanied by the clay in deep lacustrine facies, the salt-developed area is the developed area of hydrocarbon source rock and also the developed area of salt structures and salt traps. Since the area has the superior conditions of source area, reservoir, cap formation, trap and reservation, the area always is our studied key target. The paper introduced a variety of salt-deformed-related structure and trap types, characters of seismic reflection from salt and identified methods, and discussed control action of salt and salt structure on oil-gas.

Key words: salt flow, salt deformation, salt structure, seismic identification, Dongpu depression

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Complete sets of interpretation technology for lithologic reservoir. Wang Ping, Song Shujun, Wang Xinzhen, Wang Yan and Ni Shanqin. *OGP*, 2003, 38(5):557~560

The majority of lithologic reservoir is characterized of complex and subtle, its interpretation can't only rely on single technique, a complete set of interpretation techniques is necessary. The paper considers that the complete set of interpretation techniques must include following contents: ① using high-resolution seismic stratigraphy technique to study sedimentary system, build up strati-

graphic framework and determine favorable targets; ② using multi-element seismic calibrating technique to determine beneficial objective interval; ③ using seismic coherent volume technique and fault shut-up technique to determine objective interval; ④ using well-logging-constrained inversion technique to determine the favorable drilling site. Through real application in Wang-541 well zone of Niuzhuang sag, it showed this set of techniques is feasible.

Key words: seismic facies, seismic attribution, logging-constrained inversion

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Using discrete Fourier transform for interpolation of 3-D MT data. He Zhanxiang, Huang Weining and Shao ming. *OGP*, 2003, 38(5): 561~564

The rapid development of Magnetotellurics

(MT) made the processing of 3-D MT data become an importance day by day, 3-D interpolation is also an important link in latter 3-D processing and interpretation. The paper applied discrete Fourier transform to interpolation of 3-D MT data. First, processing the raw data into a column of periodic data; then, FT, interpolation and inverse FT of the data, resulted in interpolated data. The length of interpolated data is two times of that of raw data, 3-D interpolation of data is carried out along x , y and depth direction. It is showed by analysis that 3-D interpolation fully used spatial information and has certain effects on information-enhancing and noise-elimination. The real application showed the method is prospective method.

Key words: Fourier transform, interpolation of MT data, spatial data

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